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Electrical World

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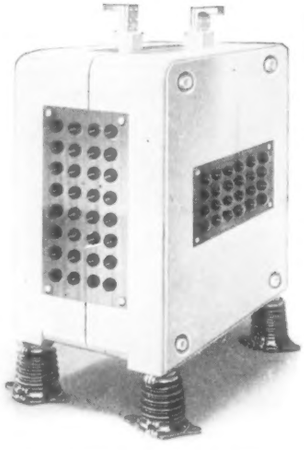

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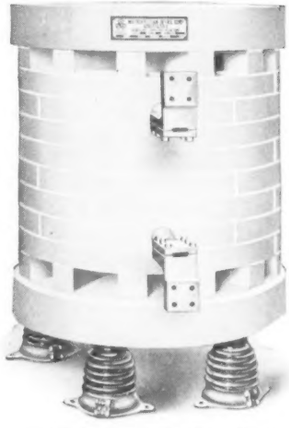

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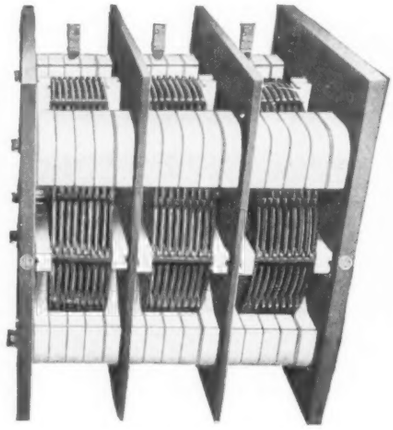

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Electrical World

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The Key Men

ALL men have marveled at the rise and growth of the automobile industry. The spectacular development of its elaborate distribution system, its splendid advertising and the rapidity with which it has been established in every town and hamlet in the land have no parallel in industrial history.

It is a familiar story to this generation, for it has all been done before our eyes. But there is this one aspect of it that merits a little further study by electrical men.

THE reason why the automobile industry has prospered so is because it has been well financed in each community. The local J. P. Morgan bought one of the first cars that came to town. This interested him in automobiling, and as he drove and watched the increasing number of cars upon the road he became interested in the automobile industry itself.

He saw the local possibilities and decided to invest some of his money in this new business opportunity, right at home where he could watch it. So he picked out some wise chap in town of the mechanical type and he set him up in the garage business. Perhaps he also financed his wife's nephew and opened a sales agency for a good family car. Then he arranged with the local bank of which he was president or a director to extend liberal credit to them.

The automobile industry became immediately established in that town as a local institution. Prominent local young men were selling cars. The garage was a conspicuous local business. Local people were buying cars. And the whole enterprise was not only sponsored but boosted by the local crowd.

BEFORE the electrical industry can take the place that it will occupy some day as a major business in each community, it must be established on the firm foundation of financial interest. There is greater opportunity in the electrical business than even in the motor car. The local J. P. Morgan has not discovered it yet — that's all. But he can be interested in the same way he became interested in automobiles.

The electrical business needs local financing because it wants better electric stores, stronger contractors and more prosperous central stations—all backed by greater public understanding and sympathy. And it will come when the local moneyed folks are using everything electrical themselves and so discover the possibilities in the electrical industry as a business for their own towns. They are the key men.

An interesting analysis of this situation appears in this issue. It points an urgent opportunity that merits study and an effort in each town.

Leonard Lord Elden

An electrical engineer who for thirty-seven years has served the electric light and power industry with distinguished ability.

ONE of the rarely discussed advantages of light and power system development on a large scale is the opportunity it affords engineers of exceptional foresight and thorough professional qualifications to apply their talents effectively in both local and national fields. This industry is fortunate in retaining the services of a number of such men who have literally grown up with it, and who bring to the problems of a great and troubled time the potent solvents of experienced judgment and mature enthusiasm. From modest beginnings these men have "made good" year by year as increasing responsibilities have been laid upon them, until today they stand among the acknowledged leaders of the electrical profession, honored by their colleagues and respected by their subordinates. Theirs has been the achievement, possible perhaps in no other profession, of advancing step by step with the industry they serve and intertwining from the very start its theory and its practice in their daily lives.

Leonard L. Elden, superintendent of the electrical engineering department of the Edison Electric Illuminating Company of Boston, Mass., has long been recognized as an engineer of the foregoing type. Since boyhood he has devoted himself to central-station engineering. In the spring of 1920 he was awarded a diamond service pin commemorating thirty-five years' continuous work for the Boston company and its predecessors. He was born at Buxton, Me., on May 16, 1868, and after graduation from the Quincy (Mass.) High School in 1885, entered the employ of the Massachusetts Electric Power Company, continuing with its successor, the Massachusetts Light & Power Company. Later this was merged with the Brush and New England Western Electric Light Companies in the Boston Electric Light Company.

Mr. Elden joined the present Boston Edison company in 1901 when it purchased the last-named system. He has been intimately associated with the electrical development of this, New England's largest light and power system, ever since, his work embracing practically every aspect of electrical service from the generating unit to the customer's installation. As his department has grown, he has devoted his attention more and more to the larger problems of forecasting the development of the system and dealing with outside companies and interests as its engineering representative. Mr. Elden was an early advocate of interconnection and has had no small part in its rapid advance during the past decade. His work as chief witness for the company in the 10,000-page Boston street-lighting rate case a few years ago was monumental in scope and added to his already noted reputation as an exhaustively informed engineer. Recent researches by him upon the loading capacities of distribution transformers mark a radical advance in practice and have aroused wide interest.

Many committees of the National Electric Light Association and of the American Institute of Electrical Engineers have had the benefit of Mr. Elden's membership. He was president of the Association of Edison Illuminating Companies in 1918. His work as chairman of the electrical apparatus committee and underground systems committee of the N. E. L. A. embodied leadership of a high order.

Editorial Comment

Electrical World, July 29, 1922

Volume 80 Number 5

Development of Colorado Resources Largely Dependent on Cheap Power

EVERY branch of the industry is or should be interested in the power possibilities of the various portions of the country. These possibilities affect not only the sales of manufacturers and jobbers, but also of contractors and dealers, and are of vital interest to the central-station companies in the immediate vicinity. Of particular interest, therefore, is the discussion of the future of hydro-electric generation in Colorado by H. B. Dwight.

Colorado is rich in undeveloped resources. Its agricultural possibilities are tremendous, and the development of a large portion of these awaits the exploitation of the hydro-electric resources of the state. The mines of Colorado, although they have been somewhat highly developed in the past, have been hampered through lack of adequate transportation, and this problem again may be solved through the utilization of the commonwealth's latent water power.

Colorado is almost the key state in the tremendous development of the Colorado River basin which undoubtedly will be actively begun in the very near future. This state furnishes a large portion of the water which flows down the Colorado River and is deeply concerned with the equitable distribution both of the water and of the power which will be generated by this water as it runs down to the sea. It is therefore of particular moment that the power possibilities and market for power in Colorado be carefully considered in relation with similar problems in the other states in the Colorado River basin.

Tact an Essential in Dealing with the Public

"I AM convinced that in general we are not half so diplomatic as we should be," recently remarked a man deeply interested in central-station matters. He was telling how a central-station official had written a consumer blaming him for not following advice given and how he had also broken the news to a prospective customer that a deposit was needed on top of some weeks of waiting and a lot of red tape.

Tact is nine-tenths of the secret of keeping the good will of the people, as they are met in the course of the business day. The average consumer of central-station service is a seeker for information, and, like all human beings in that position, he is sensitive because he is afraid that his queries may seem extremely foolish. Sometimes also he is inclined to think that the information he receives has a selfish motive back of it, and therefore he often disregards it and gets into trouble.

Any man in the central-station field who is in such a position that he must deal with the public, but who has a feeling that he must exhibit his superior quality of brains and keep those he meets in a proper position of inferiority, is clearly not cut out for central-station work.

Kindliness and tact will draw from the most timid and embarrassed customer his whole story of troubles, and these qualities are the most valuable asset any central-station man can have. Through them can be won the confidence of the individual, which means the confidence of the public. One self-important employee can do more damage to public relations than a dozen tactful ones can right. One self-important official can wreck an entire enterprise by setting the public against an otherwise well-managed business.

Wisconsin Court Limits Powers of Railroad Commission

IN ITS decision in the Wisconsin-Minnesota Light & Power Company case the Supreme Court of the State of Wisconsin not only robs the Wisconsin Railroad Commission of its full rate-making powers but sets up a new principle in rate making, based upon location or proximity of communities to the generating station. That this will retard water-power development and have a restraining influence on transmission companies and interconnected systems is apparent. However unfortunate this may appear, there is no appeal from the decision, which now stands as the law of Wisconsin. The best that may be hoped for is that the court will grant a rehearing and, in the light of further testimony and consideration, reach a more reasonable conclusion. Otherwise the extension of electric service to small towns and villages, a consummation which is certainly to the best interests of the state and the inhabitants of rural communities, will be curtailed because of the exorbitant rates that would have to be charged for the service under the decision in question.

There was no contention that the utility was earning an unreasonable return. The complaint was lodged against the unreasonable distribution of costs. Undoubtedly this added to the cost of service at Chippewa Falls, but it would seem that that condition could easily have been remedied without so sweeping a decision, upsetting recognized rate structures and indicating that every town should have a rate of its own. It was generally supposed that when the Legislature of Wisconsin delegated its powers to the Railroad Commission there were no reservations as to rate making; but apparently the law was imperfect in this regard, otherwise the Supreme Court would not have questioned the policy of the state.

The national public policy is well defined in matters of public service. No one questions the wisdom of the federal water-power act or the rules and regulations of our transportation, communication and postal systems, and yet the spirit of the Wisconsin decision is at variance with all of them. If, as in the case of the Wisconsin-Minnesota Light & Power Company, a uniform rate is not equable, a happy medium could be

found which would work no injustice and still encourage electrical development in the state. This, we feel, is a matter for the Wisconsin Railroad Commission to determine, and not the court, and any loopholes in the law should be quickly stopped by the Wisconsin Legislature.

The Use and Purpose of Accounting

DURING a recent discussion of uniform cost accounting as an aid to production before a meeting of the United States Chamber of Commerce, these questions were directed at the executives of American industries:

> Do your cost accountants realize that you, as executives, are busy men with any number of things to do and that you have neither the time nor the patience to wade through a mass of details? Do they accordingly make their cost reports simple and concise, touching the salient and principal points of information? Do they try to interpret cost results or do they force you to draw your own conclusions? Do they use graphical charts and percentages wherever possible, and do they afford ready comparisons with past or standard performances? Does your cost department keep its cost figures locked up tight within its own department or does it give them wide publicity so that the cost results may reach the entire organization down to your foremen and individual workmen? Is it a practice to call conferences in your organization to present and discuss cost results, and are preparations made to answer the questions the shop executives in particular will put at such conferences?

Here is something which every central-station executive and every electrical manufacturer, jobber and large contractor may well ponder and take to heart. The full use and purpose of accounting is too much neglected.

The Mechanical Evolution of the Storage Battery

EVER since the earliest development of the accumulator there has been a constant struggle to produce a battery of sound mechanical properties which will be able to stand up under trying conditions. Electrical failure from sheer abuse can be fairly guarded against by proper instruction, and while the final failure of a battery may be generally charged to improper use, it is greatly accelerated by faulty construction which makes the structure easily a victim of misuse.

The Bureau of Standards has done a good service in testing out for mechanical endurance some representative storage batteries. As reported by Messrs. Ilsley and Brunot in our last issue, the result was to show practical immunity from mechanical injury for all the batteries tested. A few slight faults developed, but they were not due to damage affecting the active elements as such. At the end of the bumping test none of the batteries showed any perceptible deterioration under electrical service.

This success shows a marked improvement over the conditions which existed in earlier years even in batteries heavier than those now in use. In fact, the modern batteries have tended to generally similar weight and bulk per kilowatt-hour in spite of the many forms experimented with in the early history of the art. Most of the freak types have completely vanished from the market, and he who buys a storage battery today from any reliable maker gets a pretty reliable article of fairly standardized quality. The best of it is that this condition is due, not to any conscious standardization, but to a general appreciation of sound electrical and mechanical design. The nickel-iron alkaline battery is the only material departure from the conventional type due to Planté and Faure—changed only in mechanical construction.

At all events there is no difficulty today in getting good batteries, and if intelligently used, they will give excellent service with small depreciation. To be sure, they are not foolproof; but if one goes wrong, the user has generally only himself to blame. Surely the results of the endurance test recorded last week are good evidence that even pretty rough mechanical treatment will not put a cell out of business or cause noticeable depreciation if the electrical treatment of the helpless victim is in the least humane.

The Costs of Modern Street Lighting

AVERAGES are somewhat deceitful things, yet one can draw reasonably sound conclusions from them provided his conclusions are in terms of averages and not specific to variations from them. Thus one may say that the average cost of electrical energy to the consumer is 5 cents per unit and be measurably correct for a given group of communities, but he is not thereby justified in calling 10 cents an exorbitant price for lighting in a particular place, or denouncing two cents as a ruinous figure for a chemical industry in another place. With this reservation we wish to call attention to the capital résumé of street-lighting costs in our last issue by A. F. Dickerson, which shows the prevailing conditions in American cities. It is on a per capita basis, which automatically averages local rates and conditions, leaving the net results as a factor in civic expenditures.

On the whole, the country over, the amount spent on street lighting is a little more than 3 per cent of the total budget, surely a trivial fraction considering the importance of lighting as a police measure. Experience shows the vital importance of good lighting for this purpose, and it must be constantly borne in mind in designing a street-lighting system, albeit one is not at liberty, if tactful, to call an alderman's attention to the need of more lighting in his ward because it is a notoriously tough quarter. When it comes to really good lighting the current figures become fairly consistent, wild as they are upon the whole. It seems to be well established that a city which is of fairly good size, and therefore as a matter of fact shows a somewhat dense population, can be thoroughly well lighted at a cost of somewhere about $2 per capita. Now and then this figure is materially exceeded, but generally only when "white way" or other quite flamboyant schemes are adopted.

We can hardly agree with Mr. Dickerson that a line of ornamental standards forms an important architectural element in a street. That it might do so is evident enough, but only at a staggering cost, in a community in which building laws reach further than they ever have in any American city. "Ornamental" standards cannot be produced cheaply and most of them suffer from the standard national vice of attempting to get an effect of regal magnificence for about $1.89. Really the highest compliment one can pay a street-lighting fixture is to say that it is so good that one's eye barely rests on it by day and realizes its complete effectiveness by

night. Enough highly efficient sources are now available to do the necessary work very effectively, unostentatiously, and at moderate cost.

One of the very useful features of Mr. Dickerson's paper is the stress it lays on the relation that exists between spacing and mounting height, whatever the illuminant. This is all too seldom recognized by municipal lighting authorities. A "white way" in a neighboring city stirs their souls in emulation and up go some short and glaring fixtures, not so offensive when massed at 75-ft. spacing, but intolerable when spanned out to 200 ft. In particular the recommendation for highways should be noted with its open spacing and extra high placement which can be carried out even in shaded roads by long brackets or cross suspensions. Lighting from sidewalks is quite another matter. The long and the short of it is that means must be adapted to ends with the particular situation in mind, remembering always that results are the criterion of success. Costs, at the present usual rates for service, will ordinarily take care of themselves, if the safe rule is followed of not trying to attempt the impossible.

Reliable Service Should Be Aim of Small as Well as Large Utilities

SOME of the best brains of the central-station industry have been applied to the problem of service reliability during the last quarter century. To no small extent the popularity of electric service from local utilities rests upon this quality. Extraordinary precautions are taken in the larger plants of the metropolitan companies to prevent and limit interruptions, and many of the smaller utilities have enviable service reputations. It is not always realized, however, that reliability of supply, which fairly includes regulation of voltage and standard frequency within close limits, is an asset of the small company which may be worth more to the purchaser of energy than a less reliable service from a larger organization furnished at a considerably lower price per kilowatt-hour.

Recently a local steam station of a few thousand kilowatts rating secured an industrial power contract of some 2,000 hp. connected load in competition with a water-power system many times as large. Price of energy was of secondary importance to the manufacturer, and it is understood that he was willing to pay about 25 per cent more to the local central station because of its proximity to his plant and of its excellent record over a long period as regards interruptions. We hold no brief for either company, but it is suggestive to small properties retailing energy no less than to their larger corporate brethren that reliability has so high a cash value. Long-hour business involving the operation of machinery that is producing material by processes which cannot be interrupted for more than a few moments without heavy spoilage costs is particularly desirable patronage for many small stations having the generating capacity to serve such customers, if such plants are operated on the basis of reliability first. Conversely, many of the larger transmitting organizations cannot obtain and hold certain types of business unless their reliability records closely approximate those of their local competitors. It all goes back to over-all costs per unit of product, and thus in not a few cases the manager of a small utility has a very satisfactory "look-in" when the capture of big game in power business is on the commercial docket.

Where Reliability and Tensile Strength Govern

THE first essential in the design or installation of electrical equipment is reliability. The equipment must stand up to its work or it is not what it claims to be. Next in order come satisfactory performance as regards regulation, efficiency, temperature and the like, and finally moderate cost. Performance and cost are closely related to each other, and in many cases each may be altered at the expense of the other without involving any sacrifice of the first requisite—reliability. For example, in the case of transformers, efficiency and regulation may be improved by increasing weight and cost, without much influence one way or the other on reliability.

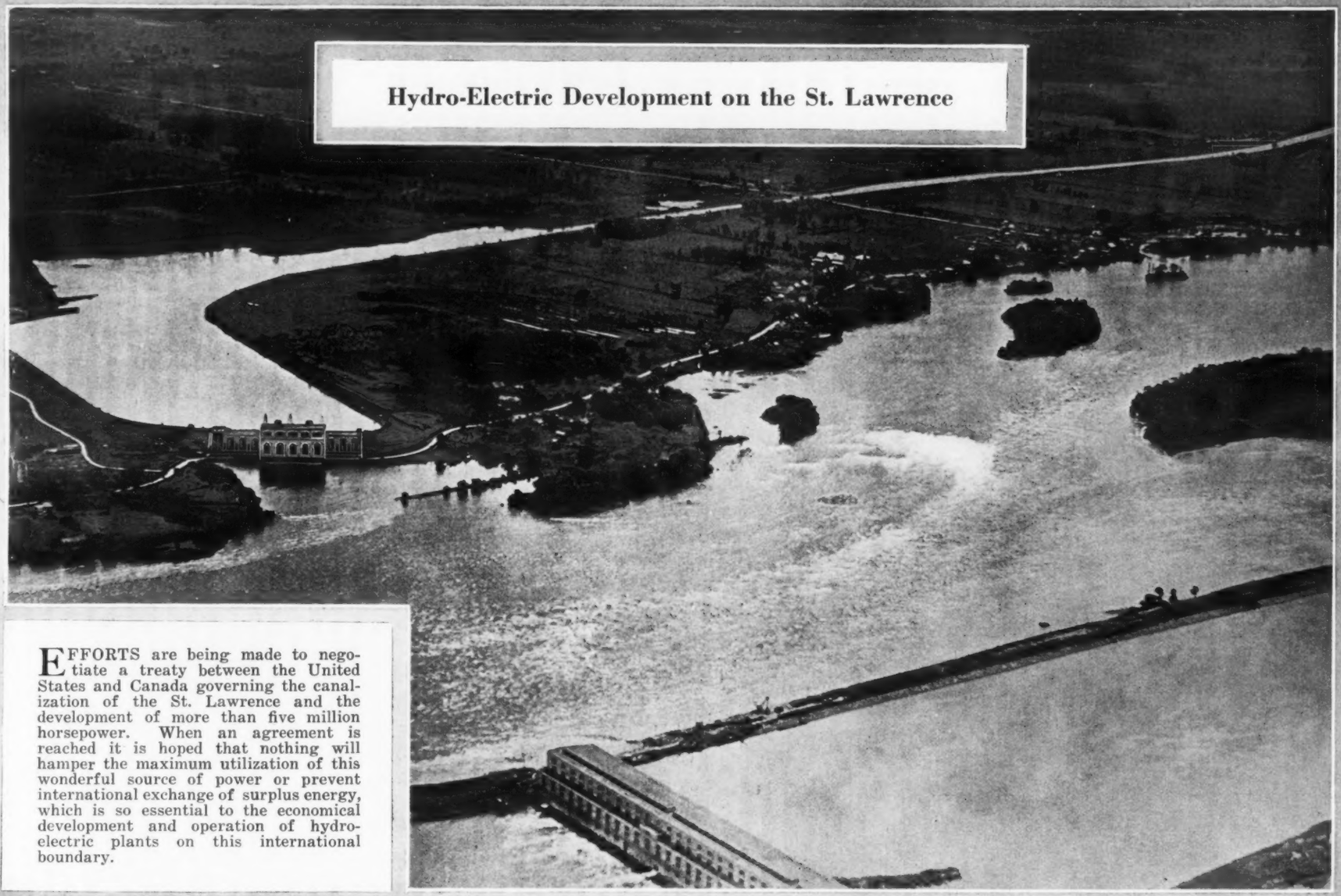
In the case of transmission and distribution lines, however, a different condition frequently arises. Copper, and less conspicuously aluminum, are selected principally for their high conductivity. They also have the no less important advantage of freedom from corrosion in the open. Neither, however, has high tensile strength, and it often happens that a line designed for satisfactory efficiency and regulation will fall quite short in the matter of reliability, when taken in relation to the normal length of span. Under these circumstances the size of conductor must be increased or the length of span shortened so as to provide the necessary factor of safety against mechanical failure. Therefore, additional cost is incurred on the score of reliability alone. These conditions have resulted in the development of various types of conductor in which a large measure of copper conductivity is retained, and in which tensile strength is added, usually by the introduction of steel.

New and important data on copper-clad steel wire and cable were presented in the last issue by B. C. Dennison. Such conductors are particularly valuable for long spans, such as are found in river crossings, and for telephone and overhead ground wires, which must be carried by transmission towers where the span is too long for small copper wires. Its non-corrosive properties make it preferable in a great many cases to galvanized steel for messenger and also for other types of supporting wire.

Additional tensile strength such as exists in copper-clad steel wire can only be obtained at the expense of some of the conductivity. The use of copper-clad wire, therefore, becomes merely a question of careful engineering analysis, and since regulation and efficiency are usually factors of the first importance, it appears probable that copper-clad wire will be limited to those instances in which the requirements of reliability and tensile strength predominate. This is especially true since apparently there is relatively little difference in cost between copper and copper-clad steel.

The new data now furnished will enable the engineer to compute with greater refinement than heretofore the relative advantages of the two types of conductor in any particular case. When making this comparison the economy of reducing the number of line supports, including poles or towers and insulators, made possible by conductors with higher tensile strength, must be balanced against the results of impaired conductivity and the possibilities of lines swinging together. However, in the case of rural lines the initial investment expense per mile of line may be the most important consideration.

Hydro-Electric Development on the St. Lawrence



EFFORTS are being made to negotiate a treaty between the United States and Canada governing the canalization of the St. Lawrence and the development of more than five million horsepower. When an agreement is reached it is hoped that nothing will hamper the maximum utilization of this wonderful source of power or prevent international exchange of surplus energy, which is so essential to the economical development and operation of hydro-electric plants on this international boundary.

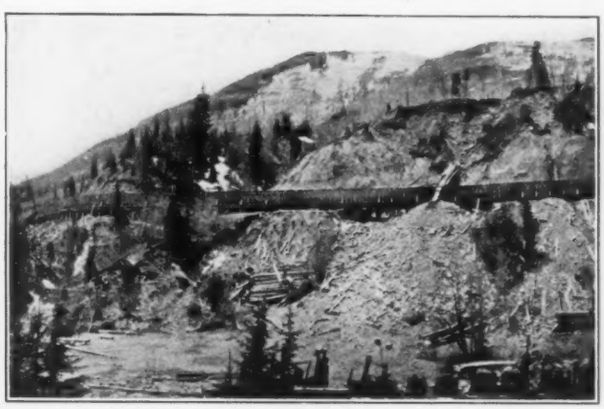
Future of Hydro-Electric Generation in Colorado

Many Large Power Sites and Other Resources of Great Potentiality Await Development—The Principal Factor Delaying Development Is Inadequate Transportation—Highly Diversified Load May Be Obtained

By HERBERT B. DWIGHT
Electrical Engineer Public Utilities Commission of Colorado

FUTURE development of the hydro-electric resources of Colorado depends upon what is promised in the production of new load centers and the rejuvenation of old ones. Increase of the present power market will come as a direct result of the revival of some of the large industries of the state, such as metal mining, stock raising and farming, or it may come from the opening up and improving of utilization of water power whenever the water is available at a reasonable cost as an auxiliary to steam generation is almost axiomatic.

Just now it seems that more than sufficient provision has been made for the present market, and there is little incentive for the companies now in the field to replace steam stations by hydro-electric stations, even though the former predominate. None the less it is



IN COLORADO ARE MANY RESERVOIRS. WOODEN FLUMES ARE USED EXTENSIVELY, BUT THEY ARE OFTEN SUBJECT TO LANDSLIDES

Left—Site of Barker Meadow reservoir of the Colorado Power Company's Boulder development; capacity is 500,000,000 cu.ft. Concrete dam in background. Right—This flume brings water to Electra Lake, Western Colorado Power Company, at Tacoma. It is 6 ft. deep, 8 ft. wide and 17,948 ft. long. A mud slide is shown on side hill.

certain large areas in which the natural resources and possibilities have been developed only in a most casual manner.

That there are a considerable number of water-power sites in Colorado suitable for development is generally recognized. From 1905 to 1910 there was great activity in investigating hydro-electric projects, and upon most of the larger feasible ones filings were made and some of the preliminary work was done. It was during this period that the largest hydro-electric system in this state was built. This system is now the property of the Colorado Power Company, and its history in supplying and developing its prospective market will clearly indicate some of the most important factors which will enter into future plans.

It appears that the question of what can be obtained from the potential market in competition with other sources of power is much more important than the question of potential undeveloped horsepower based on the probable run-off and the study of available watersheds.

That steam standby plants are essential in this state has been clearly proved. The necessity for the apparent that the dormant condition of some of the major industries in Colorado is nearly at an end, and those things will be done which are necessary to growth and progress. Much, too, will be accomplished in improving large areas in the southwest, the west and the northwest of the state, each of these sections being a large potential "empire" with the attendant possibilities of large load centers.

Colorado embraces about 93,000 square miles (241,000 sq.km.), being about 358 miles (576 km.) long by 260 miles (418 km.) wide, and nearly two-thirds of it lies in the mountainous region. East of a north and south line drawn through Denver, Colorado Springs and Pueblo lies a region of plains of the same general character as those found in Kansas and Nebraska. Dry farming predominates, and along the lines of the railroads are many prosperous towns, each with its lighting station. It seems highly improbable that any hydro-electric development will ever be able to reach this territory.

North from Denver to Fort Collins and Greeley lies a very fertile region which is largely under irrigation. This area is thoroughly covered by the

transmission lines of the Western Light & Power Company and other public utilities purchasing power from this company.

The Western Light & Power Company generates 6,000 kw. in its Lafayette steam station and it also purchases considerable power from the Colorado Power Company at its Boulder substation. It would appear that this company may soon have to increase its generating capacity. This can be accomplished by adding a hydro-electric plant to the system. The question of ownership of water rights may control, but in so far as adequacy of supply is concerned, there are suitable sites for development in the front range adjacent to this area. These sites exist on the Cache La Poudre, just west of Fort Collins, and on the St. Vrain, west of Longmont. The Western Light & Power Company also serves several coal-mining camps near Boulder and Lafayette.

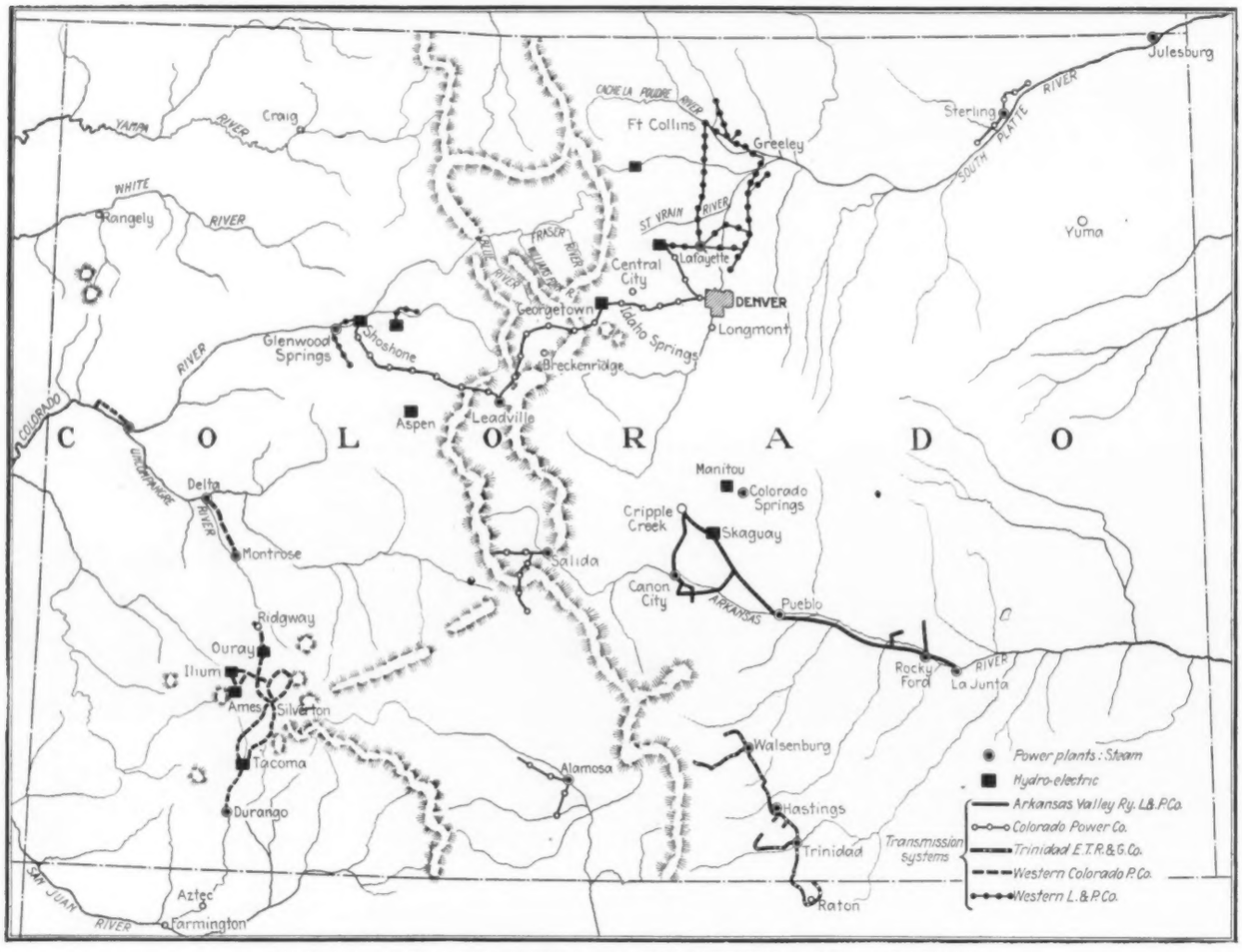
Another agricultural belt of a character similar to the one described above extends along the Arkansas River east from Pueblo to the state line. This belt is supplied from the transmission lines of the Arkansas Valley Railway, Light & Power Company, extending as far east as La Junta. This company generates its electricity in a high-head station at Skaguay, with a capacity of 1,500 kw., and in steam stations at Pueblo and Canon City. Small steam-station plants at Rocky Ford and La Junta are a part of the system. The total generating capacity is 19,320 kw.

The Trinidad Electric Transmission, Railway & Gas Company, operating steam stations at Trinidad, Walsenburg and Hastings, with a total capacity of 14,250 kw., is the other large system operating east of the mountains. Virtually its entire load is power service to coal mines scattered all over the area surrounding Walsenburg, Trinidad and Raton, N. M. There are no large hydro-electric sites in this vicinity.

The city of Colorado Springs obtains its service in part from a high-head hydro-electric station above Manitou. This station has a capacity of 2,250 kw. and operates in parallel with a steam station of 3,500 kw. This utility is the Colorado Springs Light, Heat & Power Company.

The largest prospective market for power in the state was formerly in the metal-mining regions. Several large camps have flourished there, and the prospects were excellent at about the time the Central Colorado Power Company (now the Colorado Power Company) built its system. Its 100,000-volt transmission lines tap much of this territory, and it has a network of distribution lines running to all the important mines.

These camps near the Colorado Power Company's lines center about Leadville, Breckenridge, Georgetown, Idaho Springs, Central City and Boulder County west of Boulder. It is true that Aspen is also within reach of the Colorado Power Company's lines, but it has been served throughout its life by a direct-current hydro-electric station with a present capacity of 600 kw.



EXISTING POWER DEVELOPMENTS AND TRANSMISSION LINES IN COLORADO

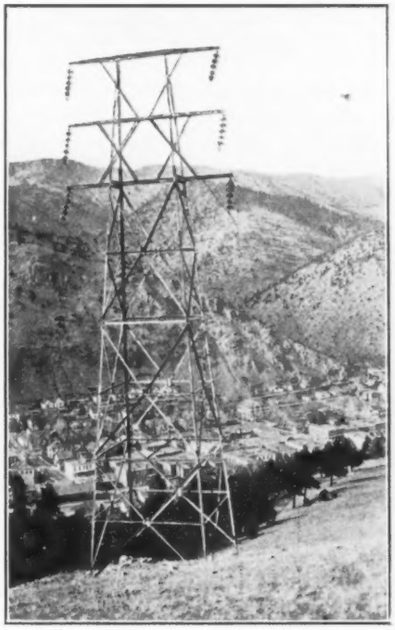
belonging to the Roaring Forks Electric Light & Power Company. In Teller County is another gold-mining district centering about Cripple Creek. Power is supplied from the Skaguay station of the Arkansas Valley Railway, Light & Power Company.

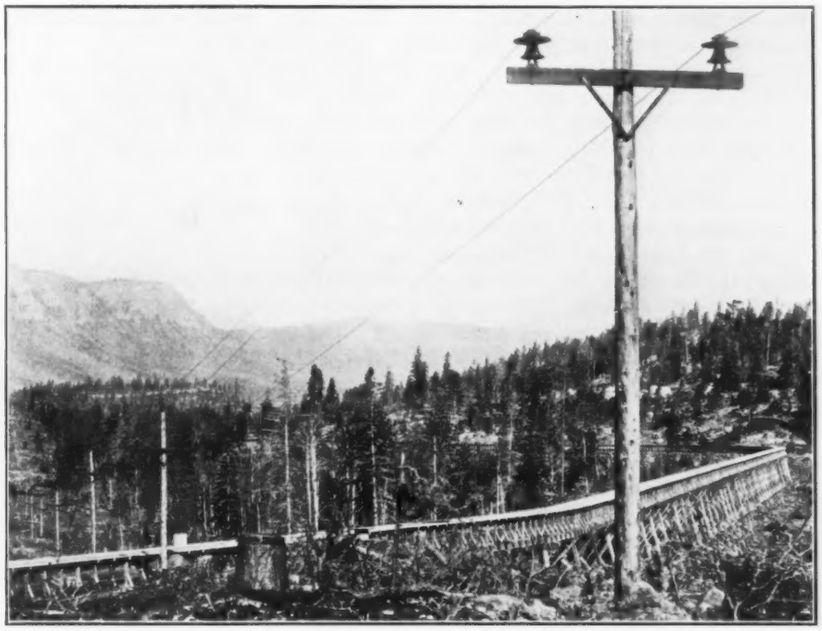
The Colorado Power Company operates large hydro-electric stations at opposite ends of its 100,000-volt transmission line, at Shoshone and at Boulder. It is a fact rather out of the common that the operating characteristics of these stations are such that each is a standby plant for the other. It is also of interest that the Shoshone station takes its energy from waters flowing to the Pacific and the Boulder station from those flowing to the Gulf of Mexico. The 100,000-volt transmission line connecting the two crosses the Continental Divide at an elevation of 12,500 ft. (3,800 m.). Parts of this line are inaccessible at times during the winter and at other times are reachable only on snowshoes. The Shoshone station uses the water of the Colorado River, which is diverted into a large flow-line tunnel driven through solid rock for 2½ miles (4 km.) parallel to the river. This tunnel was necessary because the character of the canyon through which the river flows is such that the stability of any type of pipe or flume was uncertain. Under a head of 169 ft. (51.5 m.) a maximum capacity of 14,400 kw. is possible whenever there is sufficient flow in the river. Very little storage is possible, although the water in the river is backed up for 4 miles (6.4 km.) in the canyon by the diversion dam. The storage has been limited at this site by the location of the main-line tracks of Rio Grande Western Railroad near the bottom of the canyon.

The Boulder station operates under an 1,820-ft. (546-m.) head and develops 10,000 kw. A storage reservoir with a capacity of 11,500 acre-feet (14,100,000 cu.m.) has been provided above Nederland by the construction of a solid concrete dam 624 ft. (190 m.) long and 177 ft. (53.9 m.) high. Auxiliary storage also is provided in several mountain lakes. Storage occurs during the months the Shoshone station is able to carry the bulk of the load and is utilized whenever the river flow at Shoshone is inadequate to give that station sufficient output to meet the demand. It would seem that the investment in hydraulic power works equipment is larger than might have been necessary if a steam standby station had been provided for either of the hydro-electric stations, but it is probable that the complete plans of the original company were not carried out on account of the failing power market in the mining region. As it now operates, the principal load on these stations is produced by the Denver Gas & Electric Company, which purchases power from the Colorado Power Company on a "dump power" basis, using its own steam stations for breakdown service.

At Leadville there is a steam auxiliary station of 1,925 kw. capacity, and at Georgetown a hydro-electric station of 1,300 kw. capacity under a 692-ft. (210-m.) head is operated in parallel with the system. The Colorado Power Company also operates independent steam stations at Sterling, capacity 1,150 kw., and at Salida, capacity 1,200 kw., as well as two hydro-electric auxiliary stations at Salida under 380-ft. (115-m.) and 265-ft. (80-m.) heads, having 600 kw. capacity each, and a steam station at Alamosa, capacity 500 kw.

The Western Colorado Power Company has its principal generating station at Tacoma between Silverton and Durango. This is a hydro-electric station operating under a 960-ft. (292-m.) head with a capacity of 4,500 kw. Water is impounded by the diversion of Big Cascade, Little Cascade and Elbert Creeks through long flumes into Electra Lake. This lake is 17,160 ft. (5,212 m.) long by 3,045 ft. (926 m.) wide and





100,000-VOLT LINE BETWEEN SHOSHONE AND BOULDER; TYPICAL WOOD FLUME FOR HYDRO-ELECTRIC DEVELOPMENT IN COLORADO

Left—This line, which has a length of 186 miles, belongs to the Colorado Power Company and was one of the very first lines of this voltage. At present it has suspension insulators which have proved to have a very long life in this region. Sometimes the lines are inaccessible except on snowshoes. Right — Used by the Western Colorado Power Company in diverting the water of Big Cascade Creek into Electra Lake, Tacoma development. Crossing the flume is a 44,000-volt line. Many of the transmission lines in Colorado are of wooden-pole construction, as the high altitude and dry air are conducive to long life for such poles.

43 ft. (13.1 m.) deep at the dam. This station was designed for a future increase of double its capacity. Another reservoir site of equal value exists just below the present one, and there are possibilities for the diversion of Lime Creek and other streams into this watershed.

At Durango the old lighting station of 1,000 kw. forms a steam standby plant. Silverton, Ouray and Telluride are separated from each other by high ranges, and the distribution lines connecting these districts cross these mountains at an elevation of 13,200 ft. (4,023 m.). These lines are for the most part standard wood-pole construction, but with an unusual number of guys. In bad places a combination of a push guy with an anchor guy along the top is usual. Most of this system is in a high altitude where long winters and heavy snows prevail. Snow slides are frequent, making duplicate circuits essential. Often the snow reaches a depth of 10 ft. (3 m.) and most of the lines are inaccessible except on snowshoes.

In the Telluride district at Ames there are two hydro-electric stations, one of 1,200 kw. capacity operating from two sources under 580-ft. (176-m.) and 901-ft. (274-m.) heads, and the other of 3,600 kw. capacity operating from the same sources under 560-ft. (170-m.) and 984-ft. (300-m.) heads. At Ilium is a hydro-electric station of 1,200 kw. capacity under 480-ft. (146-m.) head, this being a second development on the same river below the Ames stations. The water sources are Lake Hope, Trout Lake reservoir and the Lake and Howard's forks of the South Fork of San Miguel River. Another hydro-electric station has been erected in the canyon above Ouray, on the Uncompahgre River, with 480 kw. operating under a 390-ft. (118-m.) head. This company operates steam stations in Delta and Montrose having a combined capacity of about 450 kw.

Touching the Animas, San Juan, La Plata, Florida, Los Pinos and the Rio Piedra are thousands of acres suitable for irrigation by gravity or pumping which have been tested for years as suitable for growing corn, grain, hay, alfalfa and potatoes. The coal fields in this region are large and almost untouched. Another undeveloped agricultural area of great promise extends westward from Montrose and Delta.

The entire northwest corner of the state is unworked, awaiting cheap and adequate transportation facilities. Its response to suitable development in mineral, agricultural and live-stock production will be astounding. There are at least 1,200 square miles (2,590 sq.km.) underlaid with coal of excellent quality. Several high-grade copper mines have also been found.

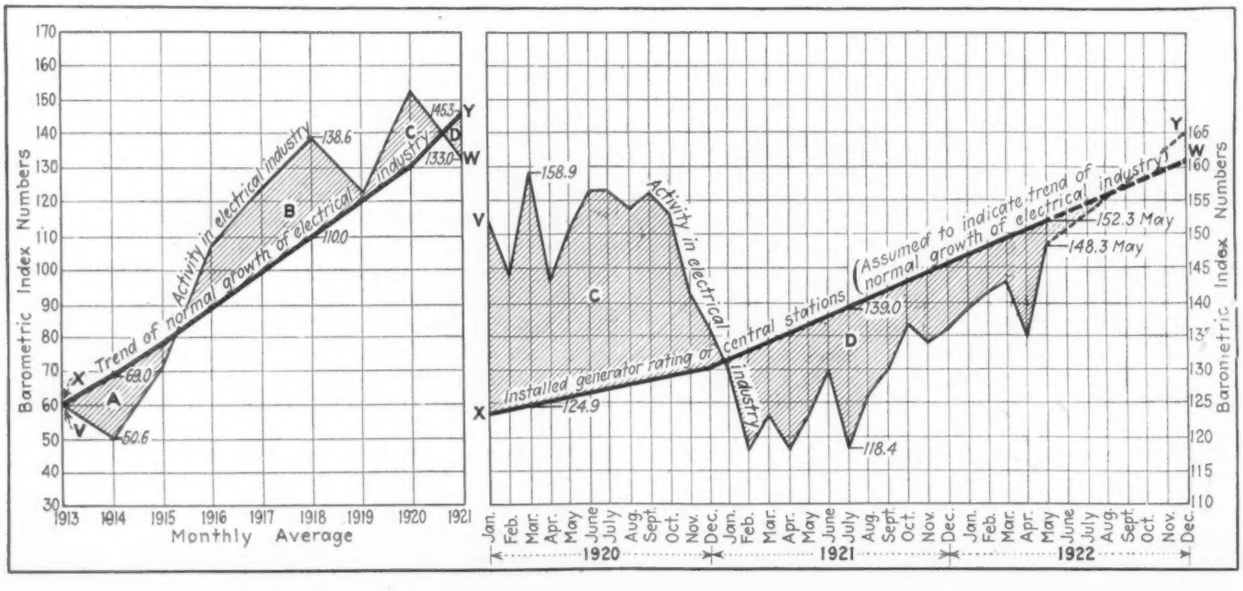
In any of the areas mentioned the response to improvement in production from natural resources can hardly be overestimated. Lack of capital has hampered the railroad in the past. Until these sections can be assured that they will have a suitable outlet to market at a fair cost, there will not be any large activity in hydro-electric development, although there are any number of feasible projects suitably located to meet any demands which the growth of the state may impose. It would seem that electrification might solve the transportation problem.

Improvement in Electrical Business Conditions During May

INDEX figures upon which the "Electrical World Barometer of Business Conditions in the Electrical Industry" is based indicate that during May every one of the primary industries of the country materially increased operations over April. The average daily total production of electrical energy by the public utility plants of the country in May was about 2.1 per cent more than that in April. This is highly significant when the fact is taken into consideration that the domestic lighting load was materially below April owing to the advancing season and also to the inauguration of daylight saving in many large cities of the country on May 1.

The "Electrical World Barometer" indicates that during the month of May business conditions in the electrical industry showed an increase of fourteen points on the barometer scale. The electrical industry as a whole during May was operating at practically four points below the point of normal demand if growth in the industry had been normal. In April it was operating at eighteen points below the point of normal demand.

ELECTRICAL WORLD **BAROMETER OF ELECTRICAL BUSINESS CONDITIONS**



Rate Decision Affecting Transmission

Wisconsin Supreme Court Holds that an Interconnected Generating and Transmission System Cannot Be Treated as a Unit for the Purpose of Fixing Rates for Electrical Energy

THE Supreme Court of the State of Wisconsin has handed down an important decision involving the Wisconsin Railroad Commission and the city of Eau Claire. In its findings the court decides against the commission's action in permitting a power company to base its rates on the total investment in the system as a whole where that system supplies a number of communities many of which are more or less remote from the power stations.

Prior to June 1, 1914, the Chippewa Valley Railway, Light & Power Company owned and operated certain hydro-electric generating plants depending on two dams on the Red Cedar River. It also operated a dam in the city of Chippewa Falls and owned and operated a leasehold interest in the so-called Dells dam in the city of Eau Claire. At that time it was furnishing electrical energy for lighting and power purposes to a number of cities, including Eau Claire. It had also built a transmission line and was furnishing electrical energy to Red Wing, Minn., and had contracted to supply certain Minnesota cities along the Mississippi River from Red Wing to Winona. The plants then owned and operated by the company were ample to meet the demands for energy from the communities which were then supplied or to which service was contemplated.

On June 1, 1914, the Wisconsin-Minnesota Light & Power Company acquired all of the stock of the Chippewa Valley Railway, Light & Power Company. The former company owned the lighting plant at Red Wing, Minn., and another at La Crosse, Wis., the power for which was generated by a large steam plant. After the Wisconsin-Minnesota Light & Power Company acquired the stock of the Chippewa Valley company, it entered into a contract with the Consumers' Power Company (now the Northern States Power Company) of St. Paul, Minn., by the terms of which it agreed that when it had completed what is now known as the Wissota dam it would furnish for a period of thirty years thereafter 23,000,000 kw.-hr. of firm energy per year, for which it was to be paid 5½ mills per kilowatt-hour at a substation at Stillwater, Minn. It further agreed to furnish a like amount of surplus energy each year, for which it was to be paid 3 mills per kilowatt-hour. This energy was to be delivered over a power line 74 miles in length, now known as the "St. Paul high line," reaching from the Wissota dam to the St. Croix River oppcsite Stillwater, Minn. The estimated cost of the proposed dam and the St. Paul high line was $3,000,000. However, approximately $7,000,000 was spent on the project, and hence the contract with the Consumers' Power Company, predicated on a cost of $3,000,000, proved to be unprofitable.

The contract was modified in May, 1917. The Wisconsin-Minnesota Light & Power Company started on a campaign to procure a larger market in Wisconsin. At the time of the order of the Wisconsin Railroad Commission fixing the rates (Oct. 9, 1920) the Wisconsin-Minnesota Light & Power Company was supplying thirty-three cities in Wisconsin and nine cities in Minnesota. The cities originally supplied by the Chippewa Valley company, as well as those now connected to the company's lines, constitute what is called a "loop" system. After the construction of the Wissota dam numerous communities were added to the lines, so that the loop system was substantially enlarged.

Rates Predicated on Entire Cost of System

In fixing the rates the Railroad Commission treated the loop—that is, all of the cities furnished and supplied by the Wisconsin-Minnesota Light & Power Company—as a unit. It divided the cities into classes, placing Chippewa Falls, Eau Claire and La Crosse in one class, Menomonie and Red Wing in another class, and all other cities or villages in a third class. It also divided the individual consumers into classes. But aside from such classification all municipalities and all consumers were regarded as a unit. The city of La Crosse, situated at least 100 miles from the Wissota dam, was given the same rate as Eau Claire and Chippewa Falls, located in close proximity thereto.

The Railroad Commission estimated that the plants originally operated by the Chippewa Valley company were unable to supply the demand for power coming from the present loop owing to the additional load and that the requirements of the present loop system for firm or constant power absorbed all of the firm or constant power generated by the original developments, as well as 71.68 per cent of the firm or constant power generated by the Wissota dam. In computing the investment chargeable to the loop system 71.68 per cent of the cost of the Wissota dam was therefore apportioned to the loop system.

In the lower court the appealing municipalities complained of this allocation and strenuously maintained that the commission had no right to regard the loop as an entity in fixing just and reasonable rates for service. The lower court, however, held that the action of the commission was lawful. It held, none the less, that an unreasonable proportion of the cost of the Wissota dam was apportioned to the loop and for that reason reversed the order of the commission. From the judgment so entered the Wisconsin-Minnesota Light & Power Company appealed.

Injustice in Rate Structure

In its decision affirming the judgment of the lower court the Supreme Court of Wisconsin said that it was deeply impressed with the thought that the fundamental basis upon which the commission proceeded in fixing the rates, and of which the plaintiff cities complain, results in great injustice to those cities and communities originally served by the Chippewa Valley Light & Power Company. As a result of the basis adopted by the commission those cities are now charged a higher rate to enable cities later brought into the loop to enjoy service at a lower rate than that at which they otherwise could be served.

The Wissota dam, the court says, would never have

been built originally for the service of the Wisconsin municipalities. Its construction was prompted by the contract with the Northern States Power Company, and had that contract proved profitable it safely may be assumed that the utility would not have sought the market afforded by the various cities and villages which it added to the original loop system. The latter development, the court holds, was not economical, and by treating the loop system as a unit the cities originally furnished by the prior developments are now called upon to bear the burden necessary to yield a reasonable return upon approximately 70 per cent of the cost of constructing the Wissota dam.

SYSTEM OF WISCONSIN-MINNESOTA LIGHT & POWER COMPANY

Unreasonable Distribution of Cost

There was no contention that the rates fixed yield an unreasonable return to the utility. The complaint is that the return to, or income of, the utility resulting from the rates fixed by the order of the commission is unlawfully and unreasonably distributed among the municipalities constituting the so-called loop system. The question, therefore, before the court was whether the commission was acting within the legislative provisions in treating the loop system as a unit for the purpose of fixing the rates to be charged by the Wisconsin-Minnesota Light & Power Company to its consumers.

In its findings the court said: "Our water powers are no doubt an asset to our state. It is no doubt wise when a water-power site is developed that it be developed to its full capacity. It is probable that in the great majority of instances a market for the power cannot be found adjacent to or within convenient distance of the water-power site, and that in order to find a market for the developed power it will be necessary to conduct the same by transmission lines to distant cities. Whether or not a city adjacent to the power is to be deprived of the advantage of its location and made to bear the burden of a portion of the expense of carrying it to a distant city is a question of public policy which should properly be decided by the Legislature. It should not be established either by the Railroad Commission or by the court. . . . As to the wisdom of the policy we intrude no opinion. We simply say that when such policy becomes the policy of the state it should be by legislative declaration. . .

"Under existing statutes the commission is required to treat the municipality as a unit and to base its rates upon the cost to the utility of serving the individual municipality rather than the average cost of serving many distinct and scattered municipalities. Because the commission in fixing the rates under review treated the loop system rather than the individual municipality as the unit, it proceeded upon an erroneous fundamental basis and its order must be vacated and set aside."

In a dissenting opinion two of the judges maintain that there is no express or direct statutory language for the conclusion of the majority or in support of it by implication. Nowhere in the public utility law, they say, is there evident any intention that such utility shall be dealt with in fragments or shall be limited in its service to but one municipality, nor can it be said that the permit to develop a water power under the laws of the state is limited to any single municipal electric service.

Manifestly, says the dissenting opinion, the scope and purpose of the water-power legislation is an emphatic negation of the idea that the utilization of the "white coal" power of Wisconsin is based upon the theory of the existence of the right to any special or particular advantage by any particular community or set of individuals. If the theory adopted by the majority opinion is the proper one as to water power, there would seem to be no reason why it should not be equally applicable to steam railroads and all other utilities.

Improved Street Lighting That Assures Greater Safety to Traffic

Illumination Requirements of East Cleveland Thoroughfares and Residence Streets Analyzed—Nature of Fixtures Employed and Illumination Produced —Both Series and Multiple Circuits Adopted

By EARL A. ANDERSON and O. F. HAAS
Illuminating Engineers, Engineering Department, National Lamp Works of General Electric Company

FIG. 1—NIGHT VIEW OF NEWLY LIGHTED STREET IN EAST CLEVELAND

THE same serious problem which has developed in nearly every city in the country in the past few years, namely, the revision of street lighting to provide an adequate system from the standpoint of safety, confronted the city of East Cleveland, Ohio, recently. Before the widespread use of the automobile the smaller cities had only local traffic of comparatively small volume on the streets. The tremendous growth of tourist and intercity passenger and truck automobile traffic, however, has meant not only a large general increase in the amount of street traffic but an especial concentration of traffic on the principal thoroughfares which lead through the cities. In effect, therefore, these streets in the smaller cities require lighting on the same level as was previously considered necessary only for thoroughfares in the large cities. Not only did this growth in volume of traffic develop new demands in lighting for traffic safety, but it also very largely destroyed the former isolation of the smaller city and made necessary an increased provision for lighting protection against crime and as an aid to the work of the police force.

The old street-lighting system in East Cleveland, which had been extended from time to time with the growth of the city, consisted of a total of 626 gas lamps and 108 magnetite-arc lamps. The comparatively low level of illumination provided by this system over the 43 miles of streets (39 miles paved) would have been considered fairly satisfactory in the days of horse-drawn traffic. However, C. M. Osborn, the city manager, and the Board of City Commissioners considered the old system entirely inadequate under the present conditions. Another factor in favor of immediate decision to change the lighting system was that in East Cleveland, as in many other cities, the supply of natural gas had diminished to such an extent that during certain periods of the year the illumination from the gas lamps was seriously affected.

Possible adaptation of the old gas-lamp posts to the use of electricity was considered, but the decision was against it in view of experience elsewhere where this plan had been followed. A review of these made-over installations indicated that the saving in cost to be expected was relatively small, and it was recognized that material sacrifices in the ultimate lighting result would be involved because of the fact that as regards location, height and construction the old posts were not of the character best suited to a system of modern high-efficiency incandescent lamps.

After a careful survey of the city all the streets were grouped into two general classes—thoroughfares and residence streets. "White-way" lighting, for which recognized good practice in a city the size of East Cleveland would be ornamental standards spaced from 75 ft. to 100 ft. apart and equipped with 1,000-cp. gas-filled lamps at a mounting height of from 14 ft.

to 16 ft., was not considered necessary as yet, since East Cleveland does not have a closely built business district.

The streets classed as thoroughfares included not only the main highways through the city but also those streets which serve as principal feeders to residential sections. These latter differ from the typical residence streets only in that they are somewhat wider and carry greater traffic. The streets classed as residential are characterized by slower traffic, mostly of pedestrians and drivers familiar with the streets. In planning the lighting this distinction between thoroughfares and residence streets was necessary, since in East Cleveland, as in practically every other city, the area to be lighted was so great in proportion to the maximum available appropriation that a careful analysis of the minimum illumination requirements of the different streets was necessary in order to insure maximum effectiveness from the system as a whole.

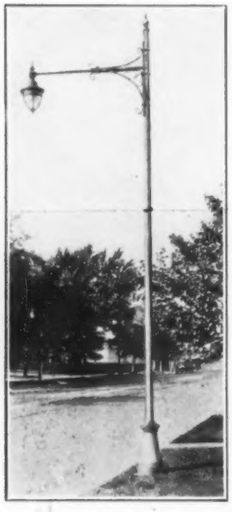


FIG. 2—TYPE OF LANTERN AND BRACKET STANDARD USING 1,000-CP. LAMPS

From this analysis the following deductions were assembled as representing fair minimum requirements which should be fulfilled by the new lighting system to be installed.

The illumination on the thoroughfares should be such that an automobile driver when moving at a standard rate of speed would be able to see a grown person or child in the street, or about to step from the curb into the street, in ample time to avoid accident; also that small obstructions or depressions would be clearly revealed. Passengers should be able to gage their footing quickly as they get on and off street cars, and it should be possible to read written addresses anywhere on the street.

The minimum requirements for reasonably satisfactory service on the residence streets should be such that obstructions or serious breaks in the pavement, or children playing in the street, will readily be seen by an automobile driver when going at a fair rate of speed, and that turns, dead ends and street intersections will be definitely marked. Any inequalities in sidewalks should be rendered visible, dense shadows from trees should be eliminated, and street signs and house numbers should be revealed. Enough light should be provided on front lawns and between houses to avoid dark hiding places; however, care should be exercised that equipment shall not appear unduly bright from the porches or upper-story windows.

Since only the minimum necessary quantity of light could be made available, it was considered imperative that the lamps should be carefully located and fitted with reflecting equipment which would most effectively control and redirect the light to the street surface. It was further considered essential that not only should the system be efficient but the lamp-post equipment and transmission system should be of a design which would not detract from the appearance of the streets. With this a system was required which would be flexible, reliable in operation and easily maintained.

The design which was developed and adopted as best meeting these requirements under the conditions in East Cleveland employs gas-filled incandescent lamps fitted with pendent refractor lantern fixtures of a new design, supported by ornamental bracket standards and supplied with energy from underground circuits. The new system totals approximately 900 lamps, of which about 600 are of the 115-volt multiple type and 300 of the series type.

Euclid Avenue, the most important thoroughfare, a 100-ft. street with a double-track street railway in the center, is lighted by ninety-three 10,000-lumen (1,000-cp.) lamps. The lamp posts are spaced at an average of 280 ft. apart on each side of the street and staggered. One lamp is provided, therefore, for every 140 ft. length of the street. On Euclid Avenue, as is the case to a considerable extent in other parts of the city, a large proportion of the side streets "dead-end" into the thoroughfares. In locating the lamps care was taken to place a lamp at the head of each of these side streets to provide an effective spread of light down the side street and to create an especially bright area clearly marking the intersection. The bright light at these points warns drivers approaching on the side street in ample time to slow down before turning into the thoroughfare. Previously, numerous serious accidents resulted from the failure on the part of drivers to realize that they were entering a thoroughfare in time to use their brakes and avoid collision.

On the wide thoroughfares carrying less traffic the lamp size was reduced to 4,000 lumens (400 cp.) and 2,500 lumens (250 cp.), at the same spacing as on Euclid Avenue. The equipment provided, however, is such that lamp sizes on these thoroughfares can be increased to 1,000 cp. whenever this becomes necessary without any alteration except adjustment of the socket position to focus the larger lamps. For the narrower thoroughfares the spacing was increased to a distance of approximately 200 ft. between lamps, instead of 140 ft. as on the wide thoroughfares. For the residential streets 150-watt (approximately 200-cp.) multiple lamps are employed, staggered and spaced approximately 200 ft. between units.

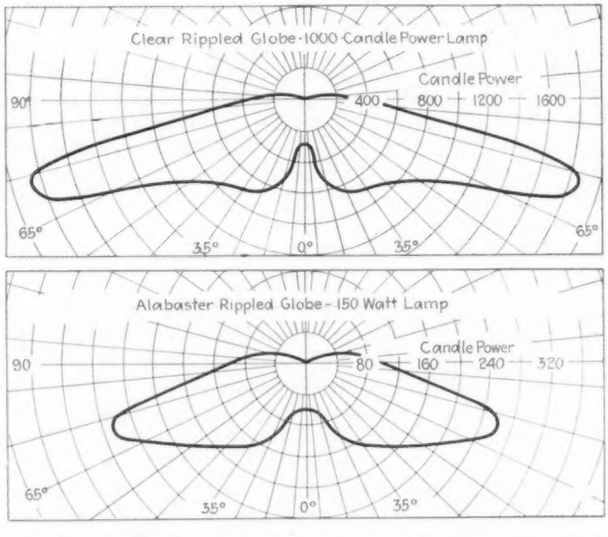


FIG. 3—DISTRIBUTION CURVES OF EAST CLEVELAND LANTERNS

The specifications developed for the equipment on the thoroughfares provided for a bracket-type lamp stand-

ard having a 6-ft. bracket and carrying the lamp at a height of 20 ft. above the surface of the street. Lower mounting heights have been found satisfactory with lamps of the same power as those used in the East Cleveland installation when employed at close spacings and with the light-colored surroundings characteristic of business district "white ways." However, under the conditions of thoroughfare lighting with wider spacings, where light backgrounds are absent and the general level of illumination is less, 20 ft. is considered the minimum desirable height.

The 6-ft. bracket length was adopted to bring the lamps out over the street and thereby to retain the advantages in lighting efficiency which have been conceded to the old-style mast-arm construction principle. A lamp position several feet beyond the curb increases the utilization of light on the street and greatly reduces the likelihood of interference with light distribution from overhanging tree foliage. Likewise, lamps placed over the street rather than behind the curb illuminate the vertical face of the adjacent curb as well as the one on the opposite side of the street. Particularly under adverse conditions, as when the street surface is wet, these illuminated curbstone faces are of material assistance to drivers by definitely outlining the boundaries of the pavement.

BRIGHT STREET SURFACE SILHOUETTES OBSTRUCTIONS

It has been pointed out a number of times that, except where there are levels of illumination of the order of those used in "white way" street lighting, considerable dependence must be placed upon seeing objects in the street at night by silhouette effect; that is, objects which are not in themselves lighted brightly enough to be easily seen are likely to be revealed as dark silhouettes against brightly lighted areas beyond, such as the spots of light beneath the street lamps. However, these bright spots of diffuse reflection are not found in the case of streets subjected to heavy, continuous traffic, where the pavement soon acquires a black polish from the action of the tires and the oil from engine exhausts. On streets in this condition, or on any paved street that is wet, the bright spots beneath the street lamps virtually disappear and the rays from the street lamps are specularly reflected by the surface, forming paths of brightness or glint from the pavement.

From the nature of this glint effect it is not possible to develop a sheen covering the entire pavement of a wide street from a single row of lamps. However, with a bracket system having lamps on each side of the street, spaced not too widely, these paths of light or glint merge into one broad strip giving a sheen of brightness covering practically the entire pavement and producing thereby a bright background against which objects may be seen in their true outline with such distinctness that an automobile driver is enabled to locate them and to estimate their rate of speed and direction of travel if they are moving.

The lamp standard which was adopted for the residence streets is similar in design to that used for the thoroughfares; however, the height of the lamp was made 16 ft. instead of 20 ft. and the bracket length was made 4½ ft. These dimensions were specified on account of the difference in the lighting problem presented by this class of streets.

The residence streets in East Cleveland are lined on both sides by shade trees in various stages of growth; hence the avoidance of foliage interference was a very important consideration. A common expedient in lighting streets of this character has been the adoption of a very low mounting height. However, in many instances, even though heights as low as 10 ft. have been adopted, interference from the low-hanging branches has not been entirely avoided. Furthermore, extremely low mounting positions greatly reduce the effective spread of light, necessitating extremely close spacings. At the same time, the light sources are brought directly within the line of vision of drivers, pedestrians and persons sitting on porches, with the result that serious interference with vision and trying glare effects have often resulted. The 16-ft. mounting removes the light sources sufficiently from the ordinary range of vision to avoid objectionable glare effects with lamps of the candlepower used. The tree-foliage clearance afforded by the bracket design at this height was, furthermore, found to be fully as effective as that which would have been obtained from a low upright post. Another advantage is that the bracket brings the light source out from the line of tree trunks in such a way as to avoid dense tree-trunk shadows parallel with the sidewalk. In working out the plan of location for the lamps, a staggered arrangement was adopted to give a further important insurance against dense shadows by providing light from different angles.

FIG. 4 — INTERIOR CONSTRUCTION OF NEW BRACKET-TYPE PENDENT REFRACTOR LANTERN

The clearance of overhead railway bridges, 15 ft., determines the maximum height in East Cleveland of moving vans and other trucks; hence, even though the lamp brackets extend over the street pavement, clearance of truck tops is assured.

In developing the new lantern fixture used in the East Cleveland installation it was aimed to retain the efficiency in light distribution of the standard pendent street-lighting units of the refractor type and at the same time to realize a desirable ornamental appearance both by day and by night. Figs. 2 and 4 illustrate the appearance and construction of the new unit, made in two sizes—the larger being employed in East Cleveland on the thoroughfares and the smaller on the residence streets. To the casual observer the unit appears to be a sectional paneled lantern. However, the construction actually involves only a one-piece rippled-glass globe supported by a basket formed of copper bands. The top of the lighting unit is a single casting to which the basket is hinged. A fired porcelain-enameled reflector is bolted to the casting and serves the additional purpose of supporting the dome prismatic refractor.

In order to reduce the loss of light due to collection of dirt to the lowest possible amount a felt globe seat is provided, against which the globe is tightly held by a spring hinge and bolt. The dimensions of the lantern

are such that even with the largest lamps used the heat is safely dissipated by radiation. Consequently, no ventilation whatever is provided and all the light-reflecting surfaces are inclosed in a bug-proof and virtually dust-tight chamber.

Candlepower distribution curves of the units are shown in Fig. 3. Nearly all of the light from the unit is directed downward toward the street surface, with the highest candlepower at the angles which cause the light to be incident on the street in the area midway between lighting units. This distribution of light is obtained with the aid of the dome prismatic refractor, which fits over the lamp and serves to redirect downward and outward the otherwise almost valueless upward

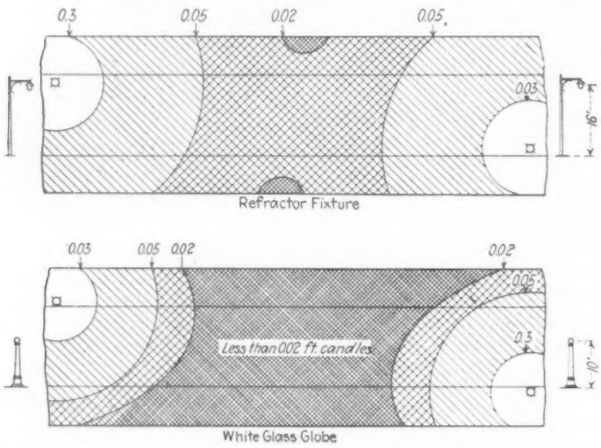


FIG. 5—STREET-SURFACE ILLUMINATION IN FOOT-CANDLES WITH REFRACTOR AND WHITE-GLASS GLOBES

rays from the lamp. Fully 50 per cent more light is made useful on the surface of the street with equipment of this character than with the ordinary opal globe. A practical comparison of foot-candles on the street surface delivered by the East Cleveland lanterns mounted on brackets 16 ft. above the street and by upright opal balls on 10-ft. posts at similar spacing distances and with lamps of the same power is afforded by Fig. 5.

An incidental advantage for residence street lighting in the case of a light distribution such as that of the East Cleveland lantern which avoids high candlepowers above the horizontal is that there is no excessive brightness directed toward upper porches and the windows of sleeping rooms.

The outer globe, which is of clear rippled crystal glass in the case of the thoroughfare-lighting units, and which is of rippled glass with a trace of opal giving somewhat increased diffusion for the lamps on residence streets, serves to break up the concentrated beams of light from the refractor sufficiently to spread and soften them, but does not materially reduce the directional effect obtained from the refractor. The function of the rippling on the globe may be likened to the nozzle on a hose which breaks up the solid stream of water in a softened yet well-directed spray. When lighted at night, the rippling gives the effect of innumerable minute prisms with a resulting life and sparkle to the lantern. The globe is not evenly luminous as in the case of the ordinary dense opal glass globe. Instead, there is a central brighter area which shades off somewhat, while the contrast between the metal bands and the lighted glass sharply defines the limits of the light source and gives a lantern effect.

The five-paneled basket was so designed that it would not materially reduce the useful light on the street. In practice, since one of the vertical bands is placed to face the lamp post, the open panels fall in such positions as to distribute the light on the street most effectively.

The lamp standards used in the installation have a drawn-steel shaft. This shaft extends directly into the ground, where it is embedded in a concrete base. The underground conduit is led out of the ground under the cast-iron base which surrounds the shaft of the lamp standard. The feed wires are carried up through the hollow shaft and inside the bracket to the lamp. Since the lighting unit is held rigidly in place by the bracket, the light is at all times steady and the objectionable variations introduced by the swinging of loosely hung pendent lighting units are avoided.

In certain locations it was desired to connect an overhead loop to supply the lamps, and this was easily arranged for by clamping an insulator bracket near the top of the pole and drilling a hole in the bottom of the bracket through which the leads were carried concealed in the bracket to the lamp.

No provision was made for lowering the lamps of the thoroughfare or residential systems, since it was calculated that the maintenance work could be carried on more efficiently and economically with the use of a tower wagon mounted on a light truck. This plan of maintenance entirely avoids the possibility of accident due to a lighting unit falling to the street and eliminates unnecessary breakage of lamps and glassware, which must be anticipated in installations where the lighting units are lowered for cleaning and renewals. A systematic schedule has been adopted which provides for thorough cleaning of the glassware by washing at intervals of approximately six weeks. At the same time, blackened or defective lamps which have lived beyond rated life but have not failed by burn-out will be renewed.

Cost conditions vary so greatly in different localities that installation cost figures are of questionable value. However, the average expenditure of the city for the multiple-lamp standards installed, including underground construction and time switches, was $131.53. The total annual operating cost of the complete new system, including payment for energy, lamp renewals, maintenance, interest on bonds, sinking fund provision, etc., is $45,000.

Features of the underground circuits feeding this lighting system will be discussed in a later issue.

Winnipeg Hydro-Electric System Ranks Sixty-sixth

THE hydro-electric system of Winnipeg, Manitoba, reports an output of 125,124,855 kw.-hr. in 1921. This report, just received, indicates that the system should have been included in the tabulation of North American generating and distributing companies having an output of more than 100,000,000 kw.-hr. in 1921, which was published in the April 29 issue of the *Electrical World*. The Winnipeg system would have ranked sixty-sixth in the tabulation. Of its total output, 60,494,902 kw.-hr. was sold to lighting customers, 36,978,097 kw.-hr. was sold to power customers, 23,000,000 kw.-hr. was used in intercompany business, line losses, etc., and 5,000,000 kw.-hr. was sold to customers for water heating and sign lighting at flat rates. The peak load was 34,264 kw., which was the record on Nov. 23, 1921. The system generates all its energy.

A Plan to Finance the Electrical Retailer Locally*

An Analysis of the Urgent Need That Exists for More Money in the Contractor-Dealer Business—Description of Method by Which It May Be Established as a Prosperous Local Business

By HOWARD A. LEWIS
Business Manager Electrical Merchandising

DUN and Bradstreet in their analysis of business failures say that inadequate working capital is one of the chief causes. Trying to do business without enough invested money and the wrong use of capital that is available are responsible, they say, for 29 per cent of all recorded business failures. Does this statement mean anything to the electrical retailing business? I think it does.

The merchandising business originally started in the electrical industry by the central-station companies selling appliances at cut prices. In some places they gave appliances away, because central stations saw this business in terms of current consumption. They financed their appliance business by charging it to "operating expense." Then contractors began to get calls for merchandise as the direct result of the central stations' activities, and the contractors financed this new business by ordering from their jobbers. They made use of their regular line of credit. This was before 1910.

Soon after we find the manufacturers starting national campaigns to sell appliances to the public, and contractors were systematically solicited to make retailing an organized part of their business activities. But the need for additional working capital was never suggested. This new business was to be financed by longer lines of credit from the jobber with a quick turnover of the merchandise. Yet "turnover" was and still is "Greek" to the average electrical contractor.

THE GREAT SPECIALTY BOOM

During the war period—from 1915 to July, 1920—came the great "specialty boom." Central-station companies retired as purveyors of merchandise. Electric specialty shops and house-to-house organizations came into existence. Curbstone contractors went to work in the shipyards. New manufacturers came into the industry with household specialties. The washing-machine business became the wonder of the industry. House-wiring work and general electrical contracting were paralyzed. There was a tremendous public demand for household labor-saving devices.

Contractors took their working capital that was invested in contracting and invested it in merchandise. Prices were rising, and the more merchandise they bought the better their balance sheet looked. Jobbers increased their lines of credit to contractors for merchandise purchases. New manufacturers gave lines of credit direct to contractors, and time-payment methods of financing came into popularity. This was a new use of credit, but not additional capital.

Three things happened to the profits made during this period—first, they were spent; second, they were invested in merchandise; third, they were invested in accounts receivable. Those profits invested in merchandise and accounts receivable became an addition to the working capital invested in the electrical retailing business—the first real addition that had been made. But when the boom broke in July, 1920, and prices began to fall and purchasers to default on time-payment contracts, this additional working capital depreciated and to a large extent disappeared.

THE VALLEY OF DESPAIR

During this period, from July, 1920, to 1922, contractor-dealers were in red ink, and of course these red-ink deficits represented a reduction in working capital. But the contractor-dealers had a tendency to blame the merchandising end of the business for their troubles, rather than the general economic conditions, and as a natural reaction there developed a desire on their part to get back into contracting. On Jan. 1, 1922, the actual available working capital invested in the business of the contractor-dealers was on a par with the amount invested on Jan. 1, 1917. Five years had passed and there was no increase in capital, and we must bear that fact in mind.

The first six months of 1922 shows a revival of building activity, based on permits let, that almost equals any record ever set for the same period. Furthermore, the average size of a wiring job has increased, for a greater number of outlets to give the present standard of service is required. As a result every wiring job today represents a larger financial transaction. Contractor-dealers will need all of their available working capital to finance needed contracting work, plus additional credit from jobbers, plus all the additional credit they can get based on the hypothecation of time-payment contracts covering wiring jobs. From a financial point of view, therefore, where does the retail end of the electrical business "get off"?

SOURCES OF CAPITAL

There are four sources of supply today for retail working capital in the electrical industry: First, the central stations have millions of dollars of new retail capital, appropriated by boards of directors of the larger syndicates, for men of this type see the advisability of aggressive retail merchandising now. "The more and better business campaign" initiated by the National Electric Light Association is an expression of this changed point of view. They want to sell merchandise to fill up the valleys in the load. I do not anticipate price cutting by central stations, but I do

*An address recently presented before the Westinghouse Agent-Jobbers' Association.

prognosticate that within two or three years much of this new capital will be withdrawn from the merchandising business and used for other purposes.

Second, there are the non-electric stores: Department and music stores particularly will put up additional working capital for financing radio sales, though not so much new capital for other electrical lines. But service work will slow up their activities, increase their general overhead and reduce the return on the capital invested in radio.

Third, there are the manufacturers, who will be opening up their own retail stores and financing their own house-to-house campaigns.

Fourth, there is the possibility of refinancing the contractor-dealer with additional working capital to be raised locally. And in this plan we will consider only the better-class contractor-dealer, say 10 per cent of the total number, established in smaller cities and larger towns, communities with 1,000 wired homes as the minimum.

TYPICAL SMALL CITY SET-UP

As a background let us get a picture of the financial situation in the average small American city or large town. Every town has its J. P. Morgan and its capitalistic group. Every town has its revolving pool of restless money-seeking local speculative investment. This money is not interested in outside speculative ventures. It is not used for general investment in stocks or bonds of large organizations. The money I am talking about wants to stay at home where its owners can watch it and have a voice in its management.

In the financial set-up of any town there is always this one richest man, who is interested directly or indirectly in one or more of the local banks. This man is the local J. P. Morgan. He has a circle of personal friends who are directors in the banks and in the other enterprises in which our richest man is usually the heaviest stockholder. This makes up the inner clique.

Usually there is another financial clique, headed by a local capitalist, interested in the second strongest bank in town. There is always more or less rivalry between these two cliques. If the town is strong financially, there may be a third clique. But the financial hierarchy of the town is made up of not more than fifty men. From two to five are listed as capitalists; two or more are lawyers; one or two are real estate men; one or more are local merchants, never over five; one or more are doctors with wealthy wives; one or more are manufacturers, if the town is in the East or Central West.

This financial hierarchy meets unofficially at some downtown club or at the country club. It has developed a class consciousness in terms of money as a result of the Liberty loan drives, Red Cross drives and other war-time civic activities which brought all the little cliques together as the moneyed group and unconsciously developed a local Wall Street spirit.

But these local financiers' only contact today with the electrical industry is through the manager or chief executive of the local central station. They know locally the money-making possibilities of the automobile business, but they do not know the local money-making possibilities of the electrical business.

Have you ever stopped to figure out how the local automobile business was financed? There is some valuable experience here for us. The local J. P. Morgan bought one of the first ten cars ever sold in his town. He then got interested in automobiling. From automobiling he got interested in the automobile industry. He saw the local possibilities for the investment of some of his money in this industry where he could watch it personally. So he helped finance some aggressive salesmen of the mechanical type, or else he financed his wife's nephew, who wanted to sell cars of the Stutz variety. He got the local bank, of which he was an officer or director, to give this new sales agency an adequate line of credit. And there you are.

For twenty years the civilized world has marveled at the supersized automobile factories with their quantity production, shipped on a C.O.D. basis. But the automobile business would not have grown as it did (despite the great latent consumer demand) if local capitalists and local banks had not financed local dealers. In 1920 we hear of Ford in financial trouble with short-time bank loans maturing and a syndicate of Wall Street bankers ready to take over the business. Next we hear of Ford making forced shipments to his dealers C.O.D., and in 1921 we see Ford making money as usual. It was the small-town financier who directly or indirectly was forced to come to Ford's rescue. Ten thousand little Wall Streets beat the big street, though they did it unconsciously.

OUR NEED FOR SUCH SUPPORT

Here is one precedent and it is well for electrical men to study it, for there are several reasons why our contractor-dealers must receive help through local refinancing. Millions of dollars are invested in our manufacturing plants and equipment, yet the central stations and non-electric stores cannot absorb the output, while additional new electrical devices are bidding today and will be bidding tomorrow for retail capital. Total possible electrical sales to the home already equal the price of a good automobile, but with a greater potential sales expense, because there are many cases where the idea of the use of the appliance must be sold first.

Our jobbers want and need more business, but they cannot afford to give more credit to contractor-dealers for merchandise—particularly in view of the immediate expansion in house wiring. But if manufacturers try to build their own local retail sales organization to take care of factory output, it will cost them more money than their present dealer spread, and retail prices will therefore be forced up rather than down, which will reduce volume. Furthermore, manufacturers and jobbers are better organized today to help get the good contractor-dealers refinanced locally than they are to organize their own local retail sales outlets. For helping the good contractor-dealer to get money locally is only a sales job, while operating a retail store is a sales, an organization and a financing job.

Clearly, therefore, the opportunity lies in the interest of local capital in the development of the electrical retail business, and I wish to submit a detailed plan by which, I believe, this local financing can be arranged. It is a job of promotion that can be carried out in these five steps:

First Step.—Through the existing jobbing sales organizations locate the contractor-dealer with sales and managerial ability. I know of one dealer who made in 1921 better than 33⅓ per cent on his investment of $8,500. The local capitalist that would put up $5,000 or $10,000 additional money in this man's business would have a speculative business investment that would satisfy the most exacting three-ball money lender.

Every jobbing organization has today an *informal* list of good accounts of this kind.

Second Step.—Have the jobbers' sales manager or a special representative (who may be a manufacturer's man) get in touch with the local central-station executives and do these things:

1. Get inside facts on the local financial hierarchy.
2. Sell the central station the plan and get its moral if not its actual support.
3. Get information from the central station regarding the number of houses wired and the various devices in use, so that you may get a true picture of the local merchandising situation.
4. Get central-station executives to introduce the special representative to the local J. P. Morgan and the other local financiers.
5. Have the special representative meet and get acquainted with the publishers of the local papers, for if the central-station executives cannot or will not give you the local financial information, the newspaper publishers will, if you tell them your plan.
6. Have the special representative talk with the contractor-dealer "prospect" and find out which of the local financiers he knows personally, which he knows by reputation, and which men in this group he particularly respects and admires.

Third Step.—Then invite the contractor-dealer prospect to the head office—invite him as a business guest. Let the principals of the jobbing organization talk frankly and fairly to the contractor-dealer about his business, the merchandising possibilities in his town, his present financial set-up and his need for more working capital. Suggest to him that he raise that capital locally and offer to co-operate and point out the definite men that the contractor-dealer can go to—particularly those men who have helped finance the local automobile dealers.

The success of this entire suggested plan depends primarily on this man-to-man interview, for the average contractor-dealer, in his own heart, does not see himself as a full-fledged business man on a par with the local dry-goods merchant and hardware-store proprietor. In his own mind he is a cross between a master artisan and some sort of a specialist. While he buys and sells and keeps some sort of books and receives credit, he does not see these things as fundamental business operations on a par with the work done by jobbers and other business men.

Work out in detail a possible refinancing plan, with maybe an alternative plan—one based on a partnership arrangement and the other predicated on the issuance of stock. The point is that you will have given the contractor-dealer something definite to take to the local capitalist. You will have put the contractor-dealer in a stronger trading position when he negotiates with the local moneyed men if he takes to them a businesslike proposition first and does not have to wait for them to make him an offer.

After the refinancing plan is worked out, let the jobber tell the contractor definitely what he will do for him in terms of an additional line of credit, sales helps, and advertising, predicated on the contractor raising this new capital locally.

I believe there are many good contractor-dealers already "sold" on the idea of getting more money in their business, but because they do not know how to work out a refinancing plan, they fail to take the first step for fear they will show their financial ignorance.

Fourth Step.—Next have the special representative see the local capitalists who the contractor-dealer would like to have invest money in his business. Usually one man, maybe two, can put up all the needed money. "Sell" these local financial men these seven things:

1. The electrical industry and its future.
2. The local possibilities and some definite ways in which money invested locally will make money.
3. The personal use of appliances, for if these local men are not using major electrical devices in their own homes you had better stop right there. There is still a job to be done.
4. The technical or specialized ability of the contractor-dealer prospect.
5. The contractor-dealer's money-making possibilities if he were properly financed.
6. The new money (approximately) that the contractor-dealer should have and why—in terms of lines to be pushed locally.
7. What the jobber's organization is prepared to do if the contractor-dealer obtains more money.

Fifth Step.—Then have the special representative bring the contractor-dealer and the moneyed man or men together, and he may or may not be present at the interview. Also, if possible, bring the central-station executives into the picture by getting them to express a willingness to co-operate with the enlarged organization. Then follow through and don't let the contractor-dealer become discouraged if the plan fails to strike fire on the first try. For time is a factor in all such negotiations.

A CONCRETE EXAMPLE

I have outlined this plan in detail in an effort to bring out all the variables in the problem, although there are simpler ways of accomplishing the same result. But I am sure of one thing—I know that contractor-dealers can be refinanced locally because I have the proof. There is a town in southern New Jersey which less than four years ago had five or six electrical contractors—the struggling kind, the unhappy kind, the kind we all try to uplift, the slow-pay kind.

This one had a different point of view. He had formerly worked for the local lighting company, but he had a little capital and started in business for himself. He instinctively resented being a slow-pay account—and he saw the possibilities in doing a real retail business.

This same town had its local J. P. Morgan and his financial cohorts. The local financial picture that I have painted was complete, and the contractor that I am telling you about analyzed himself and his business in this way and decided that what he needed was money—working capital. So he went to the local J. P. Morgan and he sold him. He sold him the electrical industry. He sold him electrical devices for his own home. He sold him the local electrical money-making possibilities.

He got the money he needed—and he has built up a real business that has paid dividends. And the local financier is satisfied because he gets a good return on his investment—also his money has helped build the town by establishing a real electrical business.

And what has been done there can be done in other towns, but to do this big merchandising job nationally there are 2,500 businesses that need on an average $10,000 each of additional capital. That totals $25,000,000. It is time that the electrical industry set to work to raise this kind of money locally.

179 Electric Appliances Under One Roof

A Survey of a Large New York Apartment-Hotel Shows a Greater Appliance Load Than That of Either Lighting or Power

BY MARY ORMSBEE WHITTON
The New York Edison Company, New York

A SURVEY recently made by the New York Edison Company in one of New York City's large apartment-hotels develops the interesting fact that the appliance load there exceeds either the lighting or power load. It has been known, of course, for several years that in the modern home, well equipped with electric labor-saving apparatus, the appliance load would normally exceed that for lighting. The lighting load of an eight-room house, for instance, would probably come to about 1,000 watts, while the possession of an electric flatiron, a vacuum cleaner and a percolator would more than balance the entire lighting load. The noteworthy feature of this apartment house survey is that apparently every apartment in this large building is well furnished with enough household appliances to make the aggregate load heavier than that of either the passenger elevators or the lighting of the entire building.

Beginning first with the summary, it was learned that in this building the company's lighting load is 114.395 kw., the total power load is 138 kw. and the total load from electric appliances is 148.419 kw. Before proceeding, however, with an analysis of the report, it must be pointed out that the figures given by the survey probably underestimate the actual appliance load by at least 10 per cent, owing to practical difficulties encountered. For instance, when apartment owners were absent at the time the surveyors called, the management arranged for the admission of the company representative, who listed such appliances as he could see, but in one small apartment, besides those which were in plain view, we have learned that the owner had a vacuum cleaner, an electric flatiron and an electric fan.

PROPORTION OF CONVENIENCE OUTLETS

In this building there are 3,363 lighting sockets and also 385 outlets in baseboards, walls and floors. On the face of it, this seems like one convenience outlet for every eight and one-half lighting sockets, not a very high proportion, but it should be remembered that this building is an apartment-hotel, with a large amount of restaurant, wall and stair lighting, quite aside from the lighting within the tenants' apartments. Taking one sizable apartment by itself, the list gives forty-three lighting sockets as against twenty-one wall and baseboard outlets. In the smallest apartments in the building the rate seems to be four lighting sockets for every baseboard outlet. It therefore appears conclusively that in the better grade apartment building the campaign for more convenience outlets has produced results.

A further analysis shows that with an appliance load of 148.41 kw., carried largely by 385 convenience outlets, the average load for each wall, baseboard or floor outlet is 385 watts. This is a fact worth consideration in estimating the size of feeders in buildings of this kind. The old figure of 50 watts for each lighting socket can no longer apply when convenience outlets enter into the calculation. Granting that some allowance must be made for diversity of use, the fact remains that probably in many cases insufficient allowance is made in estimating the probable load represented by convenience outlets in a building of this class.

As to the actual list of appliances found in this building, which operates its own hotel kitchen, the tenants had 123 electric cooking devices of various sorts, from large ranges requiring special wiring to electric toasters. The census shows seventy-four grills and small stoves, two egg boilers, three large stoves, two hot-plates, one waffle iron, twenty-three percolators and eighteen toasters. Electric flatirons form the next heavy item, some forty-two of these useful objects being located by the investigators. But one electric heating pad appears on the list, a figure which undoubtedly reports what was found, but is probably explained by the fact that owners of electric heating pads forget all about them until a toothache brings the subject to mind.

Similarly three hair curlers, two hair driers and one vibrator is a comparatively small showing for electric toilet articles, usually so popular in homes where expense is not the first consideration. Again it seems highly probable that many of these useful trifles remained securely reposing in their owners' toilet tables.

SMALLER APPLIANCES PREDOMINATE

The comparative scarcity of power appliances is explained by the general standard of living represented by the apartment hotel. For instance, one of the large apartments boasted a dishwasher, a knife sharpener and a buffer, thus indicating that the owner is accustomed to entertaining fairly lavishly within his own domains. For the most part, however, the hotel grill and restaurant offers a much easier method of providing formal dinners. Two electric washing machines and one electric ironer were found. It is assumed that the dwellers in the small apartments probably patronize the laundry. But one sewing machine appears on the list, a figure which is likely to be a little low.

The use of electric appliances reflects hotel rather than ordinary residence conditions. The living quarters range from a few one-room apartments, really hotel accommodations, through many apartments of three, four and five rooms, to a few apartments of nine and ten rooms, the equivalent high-grade residence conditions. It is found that in these larger apartments the electric equipment also is on a residence basis, one of these dwellings being provided with practically a complete equipment, including washing and ironing machines, electric refrigerator, vacuum cleaner and exhaust blower for the kitchen. The small apartments fairly blossom out with toasters, grills, percolators and other small table appliances. The various larger apartments throughout the building possess no less than sixteen electric stoves and ranges requiring heavier current than that obtainable through the ordinary lighting circuit. Of these, one was a range with a capacity of 6,500 watts, two were rated at 4,500 watts, one at 3,500, one at 2,860 and one at 2,500. The ten others were approximately of the same size, being counted at from 1,300 to 1,370 watts apiece. This display of the larger electric stoves is rather remarkable in a city such as New York, where there has never been any special cooking or heating rate available.

In all there were 179 appliances listed as in apparent habitual use under that one roof. And in spite of the high degree of service afforded by the hotel itself, these additional electric comforts provide the largest load in the building.

Letters from Our Readers

A Place Set Apart for Suggestions, Comments and Criticisms, to Which All Men of the Electrical Industry Are Cordially Invited to Contribute

A Question of Copper

To the Editors of the Electrical World:

Why do America's public utility undertakings use up copper four times as fast as is necessary? Is there any good reason why this must continue?

The electrical engineer from abroad comes to America to find advanced practice in things concerning his profession, and is not by any means disappointed on the whole, but right at the revenue-earning end of the business of electricity supply he finds an extremely low voltage of distribution and wants to know the reason for it.

Other countries, almost universally, deliver at 220 volts for domestic purposes, and the advantage over this country's practice may be seen at a glance in the equations: $V \times C = C^2 \times R =$ unit weight copper, 110 V; $2V \times \frac{1}{2}C = \frac{1}{2}C^2 \times R =$ one-quarter the former weight for the same power and area, at 220 volts.

Danger to users is not convincing, since the Old World has as many 220-volt consumers as America has 110. There they fix 250 volts as the point for caution, since that voltage will force a current of 1.25 milliamperes through the 200,000 ohms low average resistance of the human skin, and it needs quite twice that current to kill the human being.

Supplying at 220 volts leaves 30 volts within the safe limit of pressure for allowance to be made for "drop" and also for the artificial "ground" potential of the "middle" wire of a three-wire system.

Fixing the structural superiority of lower voltage lamps at 10 per cent in favor of 110-volt lamps over 220-volt, the user would hardly feel the difference, even if the public utility undertakings did not make it good in reduced rates, justified by, say, a 200 per cent saving in initial distribution outlay, while the 10 per cent extra demand would be most welcome to manufacturers.

Points of importance other than cables and lamps are that the smaller the current the smaller the switchgear, the panels to carry it, the rotaries and the secondary coils of transformers, all of which carry in their train less space and less money wasted in transit and handling, combining to lower the diversity factor of capital represented by the fraction resulting when cost installed is divided by cost at manufacturers' doors.

Manufacturers, who presumably trade on the fashioning of articles rather than retailing the raw material those articles contain, benefit exactly as above, requiring less space for raw material and finished goods, smaller works, less power to machine and manipulate the lighter articles, and would meet foreign demands without having to create and maintain a special section of their organizations for this purpose.

This case is put up for the electrical industry without apologies to the copper and transit people, for though the natural wealth of the country's copper would not be used wastefully, there is always export to fall back upon, and export markets usually bid higher than home ones.

There are probably thousands of prospects, public and private, that are held up for want of just sufficient funds, or perhaps because the outlay is just beyond the scope of anticipated revenue. What proportion of these will come within the range of feasibility if 220 volts, as against 110, brings a prospective figure of, say, $100,000 down to $75,000 if generating plant is included, or lower still if it should be a purely distributing scheme?

It might be that such developments alone would compensate the copper mines and railroads for the nation's more economical use of copper. The coming of the economical metal-filament lamp did not hurt the electricity supply companies; it brought more consumers and reduced that nasty eyesore, the "peak" load.

As with metal filaments, so with copper; so with everything, for that matter, from the historical introduction of penny postage right down to "5 and 10 cent" stores. The Woolworth Building of New York City should be nationalized as a monument to the proved fact that dollars pile up just as readily in nickels and dimes as they do in whole "bucks."

Consideration for copper gave birth to high-tension transmission and extra high tension. America is by no means backward in this direction, showing that the matter is fully appreciated. For every mile of transmission there might easily be 50 miles of distribution; why, then, is this not having more attention?

New York City. L. H. B. SANDWELL.

[What our correspondent says is all too true. Unfortunately, however, the United States has standardized on the lower voltage and some means must be found for amortizing the enormous investment in this low-voltage equipment before any change to a high voltage can be considered. If lamps only had to be changed the problem would be very simple. They are replaced after burning 1,000 hours. Not so, however, in the case of motors, transformers, generators, etc., the normal life of which is reckoned by years, not hours.—EDITORS.]

Chinese Power Plant Burns Grass

To the Editors of the Electrical World:

Some installations of scientific and engineering equipment in China are curiosities indeed. The writer has recently seen a small electric light plant that is in a class by itself as a curiosity. The plant is in the village of Shui-kow, 150 miles inland from Foochow. It is an old 15-kw. direct-current outfit run by a steam engine, all being of German make of the vintage of the early nineties. The nominal voltage at the machine is 120, but it was actually 107, while at the far end of the village it must have been much less as the lights there were hardly red. They were fairly bright in the end of the village near the power plant.

The most interesting thing was the fuel. The operators of the plant had tried both wood and coal and had not been able to make ends meet. It cost them $16 a day for fuel. Then the "chief engineer" had an idea. The mountains all round were covered with sword grass about 8 ft. high, and it could be had for the cutting and carrying. So he rebuilt the furnace and now burns grass for fuel, saving $10 a day, and the company is accumulating dividends. PAUL P. WIANT.

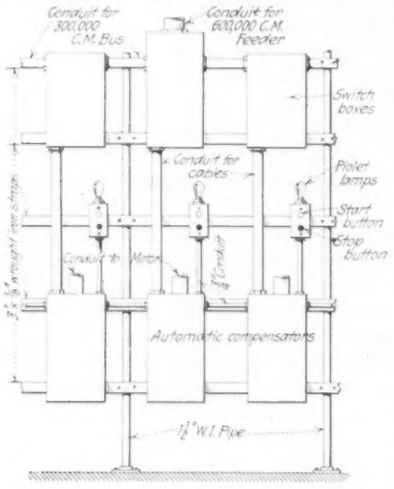
Fukien Construction Bureau,
Foochow, China.

Industrial and Station Practice

Installation, Operation, Test and Repair of
Generating and Distribution Equipment and Methods of Economically Utilizing
Electrical Energy in Mills and Factories

Neatly Arranged Motor Compensators

AN INDUSTRIAL manufacturing company planning an extension to its plant, which was to be equipped with a large number of individually motor-driven machines, found itself in difficulty properly to interlock the control devices to insure the proper sequence in starting and stopping the various motors. Each machine was to be equipped with a motor from 5 hp. to 40 hp. and each piece of apparatus usually depended upon some other piece of equipment. The questions involved were the starting and continuous running of certain conveyors upon upper floors before the elevators carrying the material from lower floors to the upper floors were started. Another question was the starting of elevators ahead of certain crushers and conveyors which discharged their product directly into the elevator boots. All the machines were motor driven and operated usually in groups of three situated possibly on different floors.



CONTROL PANEL THAT INSURES PROPER SEQUENCE OF MOTOR OPERATION

The design finally decided upon for the control of the motors was a remote push button control type of automatic compensator equipped with overload relay and low voltage release. The control circuits were interlocked so as to prevent the operation of certain motors driving apparatus in the groups which should not be operated until motors operating first had been started.

In supplying the power for the motors a 600,000-circ.mil three-conductor feeder was brought to the middle of a secondary bus that feed the bank of automatic compensators which were mounted in a row in a hallway on a pipe frame support. These compensators are fed from the 300,000-circ.mil secondary bus which extends through the twenty-one switch boxes for the motors as in the section shown in the accompanying illustration. These are connected by short sections of conduit and contain a three-pole switch which will cut out completely all equipment on that circuit when it is open.

Directly under the switch box within easy reach when the operator is standing on the floor are the master control "Start" and "Stop" push button boxes mounted in a row just above the automatic compensators. In addition to the "Stop" push button on each master control box there are a number of these buttons located conveniently near the motor and also near apparatus driven by each motor so the motor can be stopped in case of accident from several points. To start the motor up again there is only one button, which is located at the compensator. As a safety precaution the man in control of all operation is the only one allowed to restart the motor.

Motor Circuits Interlocked

As the type of automatic compensator used is inherently equipped to open in case of low voltage upon the power line, it is an easy matter to have certain of the compensators equipped with an auxiliary switch which will operate the push button control circuit for the next compensator. It is so arranged that the No. 1 compensator in each group must be in the running position before the "Start" button on No. 2 compensator in the same group will have any control upon its compensator, and so on for any number of compensators in one group. In a similar way when No. 1 "Stop" button in the group is pressed, the control circuit for No. 2 compensator is automatically opened, which in turn opens No. 3, and so on. Consequently if any "Stop" button is pressed, or if any control circuit is opened automatically or otherwise, all the other higher numbered control circuits will automatically open successively. This stops all of the motors in the cycle of operation beyond the point in which the open occurred, thus preventing conveyors and crushers from clogging up elevator boots and elevators from overfilling the conveyors.

A. L. WILLIAMS,
Consulting Engineer.
Niagara Falls, N. Y.

Method of Comparing Value of Insulating Varnishes

DETERMINATION of which of several products is the best for the money must take into account both intrinsic merit and cost, and in cases where little is known of the materials experience must be allowed to weight the decision. A method* whereby these requirements can be applied to the selection of insulating varnishes was presented at the recent convention of the American Society for Testing Materials by John A. Findley, who spoke in part as follows:

An arbitrary basis of comparing insulating varnishes can be established either from the average results of tests on a number of representative materials or by the individual investigator considering the best value in any given test as a basis with which the values given by the other products are to be compared numerically. For instance, if on the test of three varnishes we obtain an acid resistance of ten, eight and six hours respectively, ten is considered the base and the other relative values are eight and six. If in these same samples the respective disruptive strengths are 1,000, 1,400 and 1,500 volts per mil, 1,500 is the base with which the others are compared.

Suppose for brevity that these two qualities are the only ones of interest

*Presented as an appendix to report of committee on electrical insulating materials, F. M. Farmer chairman.

TABLE I—COMPARISON OF DIELECTRIC STRENGTH AND ACID RESISTANCE OF VARNISHES

Qualities Considered	Actual Test Results			Basis of Comparison	Ideal Relative Values	Translation of Test Results to Relative Values		
	Sample No. 1	Sample No. 2	Sample No. 3			Sample No. 1	Sample No. 2	Sample No. 3
Dielectric strength	1,000	1,400	1,500	1,500	25	17	23	25
Acid resistance	10	8	6	10	75	75	60	45
Totals earned in test after valuation					100	92	83	70

in a given case, we must decide which of the three varnishes we are to choose as having the most merit for our work. We can set down beforehand two figures totaling an ideal 100 per cent which represent our idea of the relative importance to the whole of the qualities considered.

A manufacturer of small motors operating in places where acid is present might say that it was three times as important that his varnish shall possess acid resistance as that it show high dielectric strength. Expressing this thought in per cent would mean that he considered the acid value as forming 75 per cent of the ideal total and the disruptive strength value as 25 per cent. Putting down the test results originally found, the bases of comparison and the ideal percentage values as we judge them, we have Table I.

It would seem from this table that sample No. 1 was nearest to meeting our needs in the ratio of 92 to 83 or 92 to 70. But the purchasing agent states he can buy sample No. 1 for $1.10 per gallon, sample No. 2 for $1.05 and sample No. 3 for $0.95. How are we to correlate our test values with these prices?

It will have been noticed that in the test procedure all tests are based upon equal thicknesses of coat. This means that an equal volume of the solid content or varnish base has been considered and used irrespective of its concentration, which may be more or less according to its particular qualities or the type of solvent used in thinning. We must therefore determine the volume of solid content contained per gallon or other unit of varnish. This can readily be done by a distillation test.

Suppose that we find the three samples contain 45, 40 and 47 per cent of base by volume respectively, and that on account of their other qualities, to obtain equal specified thicknesses of coat, additions of 10, 4 and 15 per cent of solvent were necessary respectively. Let us resort to another table and combine all these figures so as to obtain the final relative values sought for. This is Table II.

It appears from the foregoing facts that, having reduced all our results to a numerical and comparative basis and taking into account all observations we have made together with the actual cost, we have obtained a relative value for the three samples. In this case the most expensive has shown the higher relative value. It will be seen, however, that any variation in any of the figures above will change the final value.

For instance, if sample No. 3 had earned a test total of say 80, its final value would have worked out as 38, or higher than sample No. 1. Of course, a minimum limit can also be set on the ideal values for any quantity and the samples which show tests below these limits should not be further considered. If in the future the testing of insulating materials should become entirely standardized, this system can still be applied, and at that time the value of goods tested in other laboratories can be translated on a percentage basis to one's own ideal and so the relative merits of different articles for one's particular need can be determined without going to the trouble of making further tests upon points for which there already exist test values.

FIELD EDITOR ELECTRICAL WORLD.
New York, N. Y.

Thickness of Metal Welded Determines Current

IT HAS been common practice to do electric arc welding with the current too low, with the result that poor welds have been obtained. With a given arc length the quality of fusion is improved by increasing the arc current up to a certain maximum. If the current used is lower than this maximum value then the heat liberated at the crater is not great enough to fuse the parent metal properly, and the result is that the bead will show excessive overlap and poor penetration. If the arc current exceeds the maximum value, the heat at the crater is too great and the penetration is very deep. This factor must be considered in determining the current. The accompanying table gives the approximate current values for horizontal butt welds on steel plates made with bare electrodes using direct current. For lap welds multiply the current values by 1½, and for strap welds, by 1¾. D. N. LOUIS.
San José, Cal.

RELATION BETWEEN PLATE THICKNESS AND ARC CURRENT

Plate Thickness, in Inches	Arc Current, in Amperes	Electrode Diameter, in Inches
1/16	20– 50	1/16
1/8	50– 85	3/32
3/16	75–110	1/8
1/4	90–125	1/8
3/8	110–150	5/32
1/2	125–170	5/32
5/8	140–185	5/32
3/4	150–200	3/16
7/8	165–215	3/16
1	175–225	3/16

TABLE II—COST OF VARNISHES IN PREPARED STATE

	Sample No. 1	Sample No. 2	Sample No. 3
Totals earned in test, Table I	92	83	70
Percentage of base or solid content	45	40	47
Percentage of solvent added to get equal coat	10	4	15
Cost of varnish per gallon as supplied	$1.10	$1.05	$0.95
Cost of solvent as supplied	0.23	0.22	0.22
Total cost of thin varnish in state tested	1.125	1.06	0.983
Gallonage obtained in state tested	1.10	1.04	1.15
Cost per gallon in state tested	$1.02	$1.02	$0.86
Percentage of base in state tested	41	38	41
Actual relative value figure (this is the figure earned in test multiplied by the percentage of base of the thin product and divided by its cost)	37	31	34

Cable Get-Away Planned for Flexible Service

TO ENABLE cable assignments under varying load conditions to be changed conveniently without the crossing of conductor sheaths in manholes, a very careful study of the entire "get-away" problem was made in connection with the building of the South Meadow Station of the Hartford (Conn.) Electric Light Company. This plant will supply energy in large blocks by overhead connections to a 66,000-volt substation immediately adjoining the station, and the Hartford load will be supplied over 11,000-volt underground cables between substations in different parts of the city. Some of these cables require regulators.

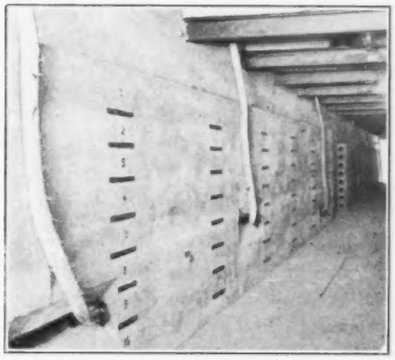


FIG. 1—CONTINUOUS DUCT RUNS OBVIATE MANHOLE CROSSINGS

To meet the above requirements and afford a systematic and clean-cut layout, the cable gallery shown in Fig. 2 was designed. Overhead feeders leave the building at the openings shown in the upper row of square panels, the lower row being reserved for lines brought back into the station after passing through feeder regulators located outside the building in cases where these are required. These panels were built

in at the time of the construction of the generating station and can be easily knocked out when required. Either overhead or underground cables may be looped outside and back through the feeder regulators, or passed directly outward for aerial service or downward to the duct lines.

The arrangement of the ducts in the basement is shown in Fig. 1. Feeder switches are arranged in groups of eight. Then eight ducts are brought into the feeder gallery from a manhole just outside the station, and the line of ducts is built complete beyond the last switch. The method of bringing the cable out of the duct is clearly indicated in this illustration. It is to be noted that one cable in the section shown comes out of the bottom duct and the other two cables cross it in ducts above.

Two inches of concrete and a tile duct lie between these cables at the crossing. In case it is desired to change the location of the cable from one switch to another, it is only necessary to open up the wall at the new point and close the original opening with a split duct and a little concrete.

The duct lines leaving the station are built in sections of sixteen ducts, each section separated by two feet of earth. Eight cables only will be pulled into each section and these are carried straight through to the last manhole without any cables crossing another outside the station. This basement duct amounts to a set of cable selective buses into which taps may be connected from the feeder circuit-breakers in the station.

R. H. SOREN,
Vice-President.
Hartford Electric Light Company,
Hartford, Conn.

Easily Constructed Types of Current Transformers

SOLID-TYPE and split-type current transformers, used for taking current readings either in industrial plants or on lines, and which have been made in its own shops, have been used for some years by the Southern California Edison Company. The transformers are very light in weight and accordingly are easy to handle. However, the split-type transformers are not acceptable for laboratory or wattmeter tests. These transformers are made for use in test sets comprising the transformer, its leads, and a calibrated ammeter, as shown by A in the accompanying illustration, and are wound with two coils, for current readings of 50 amp. or less and for 200 amp. or less. Ammeters having a full-scale deflection on 1 amp. are connected to the transformers by 60 ft. of No. 12 cable.

The dimensional details of the split-type transformers are shown in D of the illustration, and the best workmanship must be exercised in the construction if satisfactory results are to be obtained. The cores are made of 0.015-in. silicon steel punchings, although handwork may be substituted if necessary. After removing the sharp edges the core is insulated with two layers of ½-in. cotton tape and one of ¾-in. bias-cut oiled cambric, the latter being between the two cotton tapings. Each layer should be thoroughly shellacked. The 50-amp. winding consists of about twenty-eight turns of No. 16 double-cotton-covered magnet wire spaced around the core to obtain equal field distribution. As the characteristics of the iron and the type of ammeters used influence the ratio between the turns and the secondary amperes, the exact number of turns is subject to variation. The two sections of the winding are connected by a flexible jumper across the hinge. The completed winding is covered with one layer of the cotton tape and again shellacked. Because of the greater magnetic density the turn ratio of the 200-amp. winding approaches more nearly to unity. One hundred and ninety turns of No. 18 wire are used, requiring about 115 ft. of wire. These are placed in three layers on each half of the core and are connected by jumpers as before. The method and direction of winding the coils on the core are shown in F. The windings are protected on the outside by heavy tape held in place by a layer of the cotton tape. The binding posts are then placed on pads and held by strong machine thread, and the terminals are soldered to them, as shown in B. Three more layers of cotton tape are put on, shellacked and finally varnished. It is best to obtain ammeters with blank scales calibrated with the transformers and leads.

DESIGN DATA FOR SOLID-CORE CURRENT TRANSFORMERS

	Amperes		
	1,200	2,000	4,000
Number of laminations	125	125	125
Thickness of laminations, in.	0.015	0.015	0.015
Area of magnetic circuit, sq.in.	2.470	2.440	2.33
Weight of core, lb.	10.75	11.15	14.6
Secondary turns	240	400	800
Number of layers (secondary)	2	3	5
Turns per layer	130–110	145–135–120	180–176–168–161–115
Size of wire, No.	13	13	10
Length of turn (average), in.	7.15	9.25	13.3

A solid-core type of current transformer, shown in C, has also been made by this company for use in making wattmeter tests. The ratio and phase angle are well suited for this, as is shown by the curves in E. Design data for these transformers are given in the above table.

The core is made of 125 rings of 0.013-in. silicon steel. The outside diameter is 6⅞ in. and the inside 3$\frac{31}{32}$ in. The core is approximately 1⅝ in. thick and has a cross-section of 2.6 sq.in. The laminations are

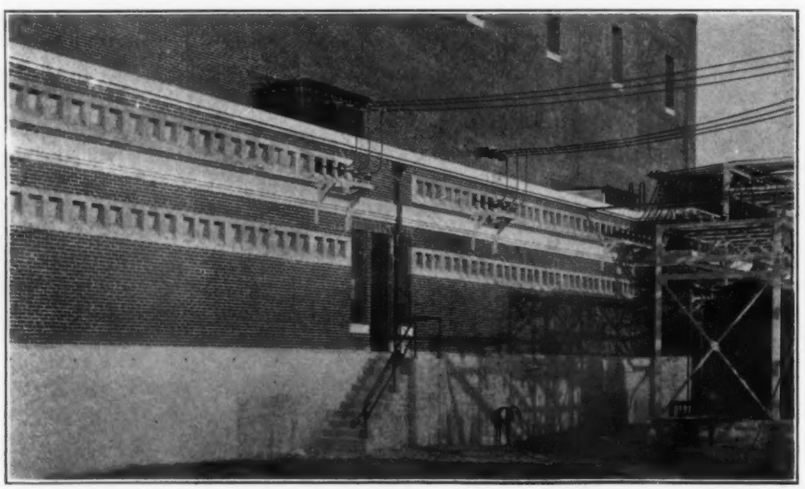
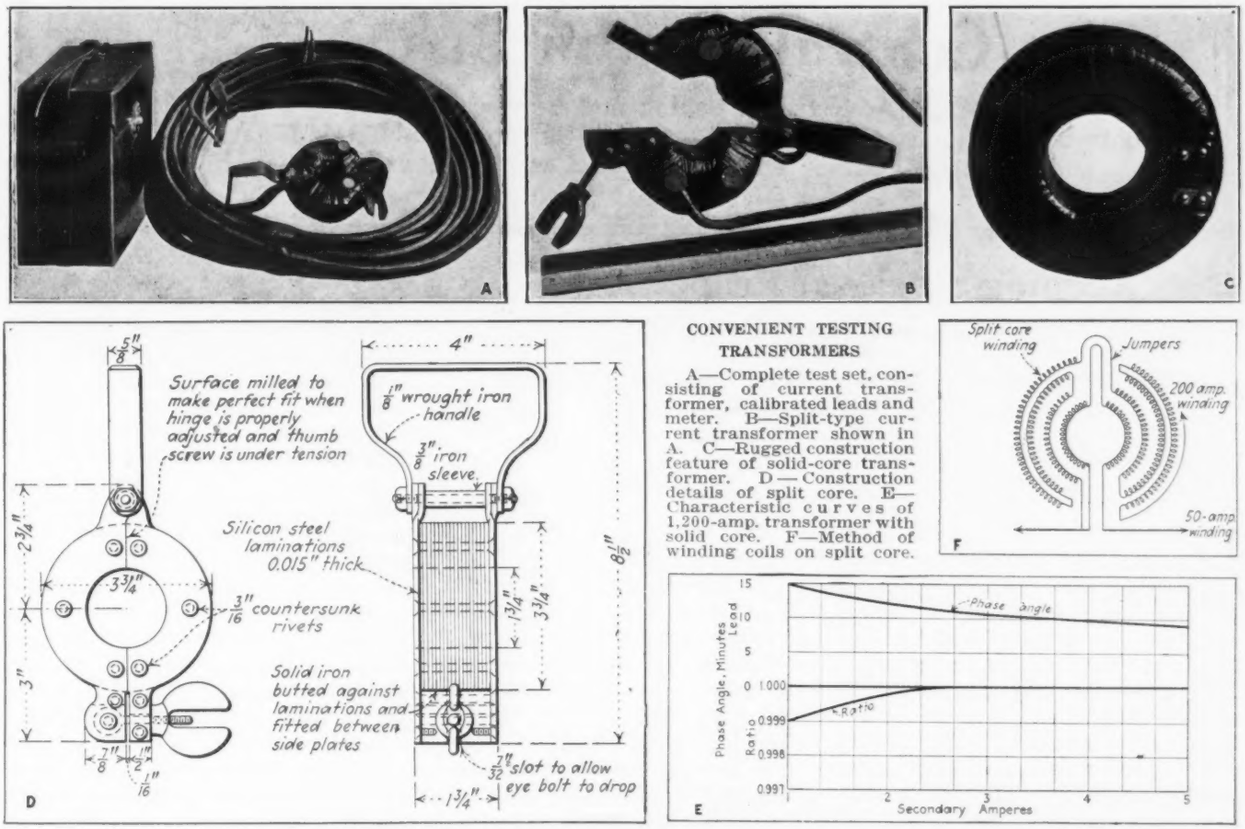


FIG. 2—GALLEY DESIGNED FOR FEEDER EXIT WITH OR WITHOUT REGULATORS



CONVENIENT TESTING TRANSFORMERS

A—Complete test set, consisting of current transformer, calibrated leads and meter. B—Split-type current transformer shown in A. C—Rugged construction feature of solid-core transformer. D—Construction details of split core. E—Characteristic curves of 1,200-amp. transformer with solid core. F—Method of winding coils on split core.

tightly clamped, bound with ½-in. cotton tape and shellacked. Over this is placed a layer of 0.015-in. varnished pressboard bound with ¾-in. tape and again shellacked. The terminal blocks are riveted to brass plates which can be bound to the side of the finished coil.

The winding consists of 240 turns of No. 13 double-cotton-covered magnet wire wound in two layers, of 130 and 110 turns respectively. Between the two layers varnished pressboard is held in place by 1½-in. stay binding.

W. R. FRAMPTON,
Superintendent Test and Meter Department, Southern California Edison Company, Los Angeles, Cal.

Turbine Economy and Reserve Capacity

FACTORS which bear upon the amount of reserve capacity needed in the modern steam-driven central station equipped with large and economical turbine units were briefly discussed by L. L. Elden, electrical engineer with the Edison Electric Illuminating Company of Boston, during a hearing on rates before the Massachusetts Department of Public Utilities. Mr. Elden said that the installed generating capacity of the company attained a maximum of 173,000 kw. during the past winter. The peak load was 128,200 kw. The Boston system has always been operated on the theory that a reserve equipment to the largest unit should be constantly maintained. Up to the time that the first eight units, aggregating 96,000 kw., were installed at the company's L Street station, this meant 15,000 kw. in spare capacity. In the first-built section at L Street the company maintains six engine-driven units aggregating 9,000 kw. rating, and these have been of value in emergencies.

With the installation of 30,000-kw. units, of which two are now in use at L Street, the percentage of reserve was greatly changed. The company has striven to maintain 30,000 kw. in spare capacity, and the performance of the 30,000-kw. units has been such as to prove this a sufficient reserve under the conditions. New loads have been taken on, however, the total added in 1921 being 25,000 kw., and the increase of the load by steps of 3,000, 5,000 or 7,000 kw. in short periods of time, coupled with the fact that at times the company has had 60,000 kw. in horizontal turbines out of commission without any notice, because of hot bearings and failure of windings, has brought it face to face with the proposition of having at least two units of 30,000 kw. each available without regard to the service other units are performing.

A third 30,000-kw. unit is to be installed at L Street to meet the above conditions.

The efficiency of the new 30,000-kw. units in fuel consumption is about 1.4 lb. per kilowatt-hour, compared with about 1.6 lb. with all the L Street turbines in service. With the two 30,000-kw. units out, the fuel consumption is about 1.9 lb. Since 1919 the company has been unable to get the full benefit of these larger units by continuous use of them at high load factors. Operating difficulties, due perhaps to the rapid development of the art of turbine design and manufacture in very large units, have appeared in virtually all makes placed on the market. The service of such units is improving, however, Mr. Elden said, and the operating results in 1921 were better than those of 1920. Before the war the Boston company reached a manufacturing cost at the station of about 4.8 mills per kilowatt-hour. High fuel, labor and supplies cost, the witness added, have increased this manufacturing cost. For the last half of 1921 this cost was just under 1 cent.

FIELD EDITOR ELECTRICAL WORLD.
Boston, Mass.

Central Station Business

Advertising, Selling and Service Methods
Commercial Organization and Management, Customer and Trade Relations, Public and Financial Policies, and Reports of Company Plans and Experiences

Keeping Stocks at Proper Level Shows Good Profit

Perpetual Inventory Holds Down Stock Investment, Increases Turnover and Eliminates Dead Stock

By M. J. Kane
Contract Agent Harrisburg Light & Power Company, Harrisburg, Pa.

DURING the year 1921 the Harrisburg Light & Power Company sold slightly over $100,000 worth of electrical appliances in its office salesroom, realizing a profit of approximately 18 per cent on the gross sales. This business was transacted almost entirely on the sales floor by a floor salesman with his assistant. There were no outside salesmen or solicitors working in the company's territory.

In order to make this volume of sales with its accompanying profit two important factors have been carefully watched. One has been to see that an ample and well-diversified stock was properly displayed in the salesroom at all times, and the other factor, which was probably of first importance in showing a profit on sales, has been the use of a system for keeping the stock inventory up to date so that it would show at any time the quantity of appliances and material on hand. A card-index form of inventory was adopted, from which it is possible to ascertain the quantity of any particular article in stock. This card index amounts to a perpetual inventory, and the form of card used is reproduced in Fig. 1. A study of this form will show that it not only gives the quantity balance of the item but shows the daily sales as well.

When a shipment of material has been received and billed, a card is filled out with a description of the article, quantity received, the amount of the invoice, to which are added freight and drayage charges, which give the total gross cost. The unit cost is then obtained and the selling price entered as shown in the upper right-hand corner. At the close of business every day the duplicate sales slips for appliances sold are sorted and the quantity of each is entered under the quantity issued. This is subtracted and the quantity balance shows the number of that particular item remaining in stock. As these entries are made every day it is possible to tell exactly what stocks are getting low and when the reorder should be placed.

This card is a part of a system of keeping stock records which the Harrisburg Light & Power Company has used for the past three years and has found to be a comparatively simple and extremely reliable method of handling its stock.

The other forms used are shown on the opposite page. Fig 2 is the form of order to the stockkeeper for material, Fig. 3 is the stockkeeper's record of material issued and Fig. 4 shows the form used for the monthly recapitulation of all material taken from stock. Material coming into stock is entered first on the form shown in Fig. 5 and a temporary inventory card like Fig. 1 but of different color is made out and held until the bill is received, when the cost plus freight and drayage are added and the permanent inventory card, Fig. 1, is made out. A record of all invoices for material received is kept on the form shown in Fig. 6.

By the use of this form of card inventory it has been possible to maintain stocks at the proper levels without overordering or permitting stocks to become too badly depleted. It is possible to tell by looking over past sales how rapidly an article has been moving and thus keep the amount of money invested in stock at the lowest possible figure. Items which prove to be slow movers can be quickly spotted and a special price made in order to move them more rapidly. The rate of turnover has been increased and dead stock has been practically eliminated. It is a very easy matter at the end of each month to ascertain what profit has been made and to determine what class of merchandise to push.

We believe that this system of keeping a perpetual inventory has been the principal means of our having been able to show a fair profit on merchandise sales. Our sales force has been small and virtually all sales are made directly from the office floor. A fair amount of advertising

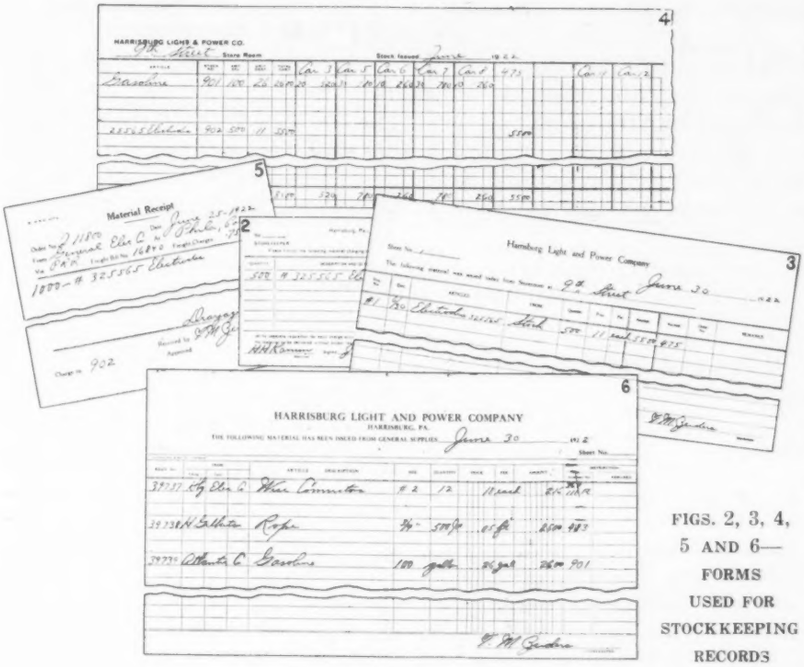
HARRISBURG LIGHT AND POWER CO. BIN No. 905
ARTICLE 6½ Mt. American Beauty Iron
MAX. MIN. 7.50 UNIT

Order No.	Date Rec'd	FROM WHOM PURCHASED	Quantity	Amt. Invoice	Freight Drayage	Gross Cost	Unit Cost
11896		Ramsay Electric Co.			Fr. 1.32		
81648	5 20 22	INVOICE NO. 15-026	24	1 1 8 21	Cr. .25	1 1 9 78	.99

ISSUES

DATE Month	Day	QUANTITY ISSUED	QUANTITY BALANCE	DATE Month	Day	QUANTITY ISSUED	QUANTITY BALANCE	DATE Month	Day	QUANTITY ISSUED	QUANTITY BALANCE
5	24	2	22								
5	29	1	21								
5	31	1	20								
6	1	1	19								
6	2	1	18								
6	5	1	17								
6	6	1	16								
6	8	3	13								
6	9	1	12								
6	10	1	11								
6	15	1	10								
FORWARD				FORWARD				OVER			

FIG. 1—INVENTORY CARD SHOWS EXACT STOCK ON HAND



FIGS. 2, 3, 4, 5 AND 6—FORMS USED FOR STOCKKEEPING RECORDS

is carried in the local papers, and windows have been changed weekly. In addition to this there is the advantage, of course, that customers come into the office to pay their bills, and as there are approximately 18,000 residential customers connected to our lines at this time we have a very good opportunity to show them the appliances in the salesroom.

Electric Tractor Effects Saving in Labor

THAT marked economies can be realized by the use of electric tractors in industrial plants is demonstrated by the experience of the Hamersley Manufacturing Company, Garfield, N. J. The drop-frame electric truck shown here has been in constant operation in the company's paper mill since 1916, and in the department where it was used the labor required for handling paper rolls was cut down from eighteen hand-truck men to twelve.

BATTERY TRACTOR WHICH REDUCED LABOR ONE-THIRD

Utility Association Adopts Code of Ethics

IN ORDER that the executives of public utilities in Oklahoma may have a common aim and purpose in giving out information regarding their companies and the industry in general, a code of ethics has recently been adopted by the Oklahoma Utility Association as a standard to govern its activities. The code is as follows:

Public utilities are natural monopolies and as such should be subject to public regulation as to all matters touching public interest. If public regulation is to be successful, it must be intelligently administered, but it cannot be so administered by an uninformed public; therefore:

1. It is the duty of all members of this association to avail themselves of every opportunity, and to seek opportunities, fully and honestly to acquaint the public with all matters relating to the operation of public utilities.

2. Public utility managers are trustees, whose duties are to safeguard and protect the interests of the public, the employee and the investor, and the acts of such managers should be influenced by a full realization of these responsibilities.

3. It is the duty of every member of this association to strive in every way to promote peace and harmony among its members, and to uphold and support every honest policy or aim of all public utilities, and to discourage and condemn such policies or aims as are unjust or unworthy.

4. No business transaction is, in the final analysis, satisfactory or profitable to either party to the transaction, unless it is satisfactory or profitable to both, and every transaction should be carefully analyzed with this principle clearly in mind.

5. It is the duty of every public utility to take an active part in public affairs, in the interest of honest, efficient government, and to enable such utilities correctly to learn the needs of the community and to build intelligently to keep pace with its growth.

6. Public utility enterprises are honorable and worthy, and they afford distinct opportunities for individuals to serve society effectively.

What Other Companies Are Doing

Worcester, Mass. — Appliance sales by the Worcester Electric Light Company during the past few months reflect a decided improvement in business conditions. During April and May the company sold 235 vacuum cleaners, a prize of one cleaner being awarded to every salesman disposing of twenty outfits within the time limit set. To stimulate sales during the last three days of the drive a boudoir lamp was given to each man selling six cleaners. During June an electric flatiron was given as a prize to each salesman disposing of eleven cleaners in fourteen days. House-to-house solicitation, supplemented by a nominal amount of newspaper advertising, was used. Gross appliance sales ran about $2,000 a week until a recent short period of bad weather, which reduced this by about $300. O. R. Underhill is appliance department manager.

Louisville, Ky.—H. M. Byllesby & Company are issuing a twelve-page booklet giving the latest information and statistics regarding the Louisville Gas & Electric Company. The development of this company from 1838 to the present day is described by various charts and photographs. The kilowatt-hour output for 1921 has increased 126 per cent since 1914.

Akron, Ohio.—Employees of the Northern Ohio Traction & Light Company sold $675,000 worth of 7 per cent preferred stock in the past nine months during an energetic sales campaign which has just come to a close.

Digest of Electrical Literature

Including Brief Abstracts of and References to
Important Articles Appearing in the Scientific and Engineering Press
from All Parts of the World

Hydro-Electric Development and Steam Equipment

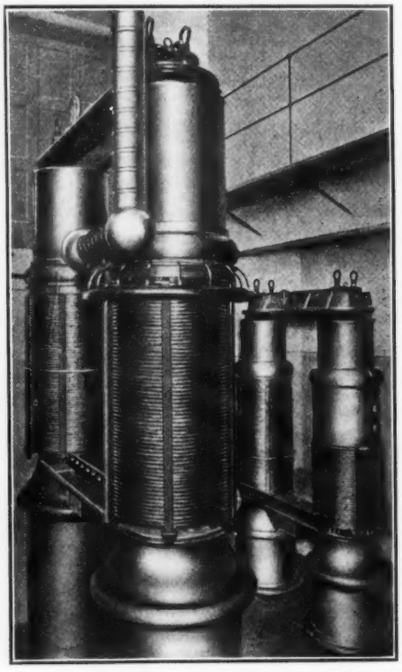
The Power Supply of Bavaria, Germany.—A. MENGE.—A project for a uniform power supply is under way in this part of Germany, utilizing the water resources near Munich and including four existing steam plants. One company is building a plant on the Walchensee which will have a total output of 126,000 kva. and four small generating plants along the Isar which will have a total capacity of about 55,000 kva. These smaller plants, with the necessary transmission lines, are expected to be completed by 1924, while the Walchensee station will be able to deliver about 100,000,000 kw.-hr. per year by the fall of 1923. Three-phase current at 50 cycles and 110,000 volts has been chosen for the trunk lines. Four standard types of steel towers, two for double lines and two for single lines, are used for the entire transmission system. The Walchensee station contains four single-phase, 16⅔-cycle generators for railway supply and four three-phase, 50-cycle generators for general power supply. The latter consist of 24,000-hp. single-runner Francis turbines connected to 20,000-kva., 500-r.p.m., 6,600-volt generators. The three-phase generators are connected in Y, the neutral grounded over a resistance of 0.8 ohm, which will carry 4,500 amp. for ten seconds. Thirteen indoor-type substations are located along the transmission lines. In every substation are installed, according to its size, two to four rotary condensers of 8,000 kva. or 16,000 kva. to compensate the power factor in the lines.—*Elektrotechnische Zeitschrift*, May 28, 1922.

Power Development in the Southeast.—CHARLES G. ADSIT.—The author emphasizes the dependability of the water power of the South and states that the resources available can make ample provision of power for the growing industries of that section. A table giving the developed water power and the steam power of Alabama, Tennessee, Georgia and North and South Carolina is given. This table shows that the developed water power equals 492,500 kw., while the steam power is 181,000 kw. The present state of the Muscle Shoals development and future possibilities are described.—*Mechanical Engineering*, May, 1922.

Generation, Control and Switching

The Behavior of a Plunger-Type Protective Relay.—Y. TORIYAMA.—The manner in which the magnitude of the pull on the plunger varies with the initial position of the plunger is experimentally determined. The velocity and the dynamic pull at every point of the travel during the upward motion of the plunger is also determined and the results are given in curves and tables.—*Journal of the Institute of Electrical Engineers of Japan*, May, 1922.

Generators for Water Turbines.—R. BUCHTA.—The designer of large generators for medium and high speeds will find in this paper, with its thirty-seven illustrations, a great deal of information on the mechanical details of



DRY, AIR-INSULATED 500,000-VOLT TESTING TRANSFORMER (H. DE RAEMY)

such machines. On account of the overspeed guarantee now usually required, special attention has to be paid to insure a very rugged rotor construction that will withstand the centrifugal forces exerted by the pole pieces. The different constructions are shown on generators of from 500-kva. to 15,000-kva. capacity.—*Siemens Zeitschrift*, May and June, 1922.

Considerations Relating to the Design of Oil Circuit Breakers.—D. R. DAVIES.—The author first discusses the methods usually adopted for reducing the losses in oil circuit breakers. Information is then given which can be used for estimating the maximum temperature rise of small conductors during short circuits. This information is also applicable to potential transformer connections or the like.—*Electrician*, June 16, 1922.

Transmission, Substations and Distribution

Modern High-Voltage Transmission Lines.—E. SPLITTSTÖSSER.—Mechanical and electrical data are given in this article on the newly installed 100,000-volt trunk lines in Germany, with particular emphasis on the safety of the suspension system. Steel-aluminum cables are receiving the preference over copper. While the older lines had three grounded steel cables for lightning protection, the use of one of these has now been found sufficient. Joints in the bimetallic cables are made separately for the steel and the aluminum with a notched sleeve connector. Cap-and-pin type insulators are used more frequently than Hewlett chains, because they are held to be cheaper, shorter in over-all length and better from the voltage distribution standpoint.—*Siemens Zeitschrift*, May and June, 1922.

New High-Tension Insulator.—L. PERRIN and E. PIERNET.—The authors try to overcome the difficulty of unequal voltage distribution along an insulator chain by simply avoiding any metal parts. A number of specially formed porcelain insulators are held together by short studs made of oil-treated wood and cemented into the individual porcelain disks. In this way a solid porcelain insulator column may be built up. Another method is where the individual porcelain parts and studs are made hollow, so as to form a wall or a roof bushing. It is also possible to give the intermediate studs a ball-shaped upper part and to hold this ball within the hollow, spherically shaped head of each porcelain by a retaining collar of cement. This will result in a flexible chain, swinging with the ball heads as fulcrums. Tests made with these insulators at the French testing laboratories showed great mechanical strength and an almost perfectly proportional voltage distribution along a chain of four of these units with 110,000 volts.—*Revue Générale de l'Electricité*, May 13, 1922.

Units, Measurements and Instruments

500,000-Volt Testing Transformers.—H. DE RAEMY.—High-voltage electric testing equipment, in keeping step with the increasing transmission voltages, has to cope today with potentials of 500,000 volts to 750,000 volts. In Europe, where oil is difficult to obtain and consequently high in price, successful attempts had been made recently to design such transformers as a dry, air-insulated type. One firm has lately installed several such sets, two of which, each for 500,000 volts, are described in these two papers. In both cases the high voltage is obtained by series connection of two transformer units. The machines are very bulky and in both the described laboratories extend through two stories (9 m.). To keep dangerous corona discharges down to a minimum, a number of well-designed and properly placed metallic shields have to be used as equalizers

around the ends of the windings.—*Bulletin Schweizer Elektrotechnischer Verein*, June 22, 1922, and *Revue Générale de l'Electricité*, June 10, 1922.

Illumination

Better Signs.—C. A. ATHERTON.—The development of electric signs has progressed to a point where there is need for a more exact engineering basis of design and a more artistic treatment in general. Because of the adoption of lamps of higher wattage it has become necessary to determine the relative size of the spot of light obtained from lamps of different wattages, in order to predetermine the exact pattern of the appearance of the sign. An equation has been developed for this. A modification of this equation is given which may be used for the determination of the maximum distance at which Gothic letters may be read under normal conditions. Through another adaptation of the equation, lamp spacing for various wattages is determined by various types of signs. An example of the proper spacing is given in the accompanying table. Proper illumination of inclosed lamp signs is discussed and a simple rule formulated for obtaining satisfactory results.—*Transactions of the Illuminating Engineering Society*, May, 1922.

LAMP SPACING FOR EXPOSED LAMP SIGNS TO OBTAIN THE APPEARANCE OF A CONTINUOUS LINE OF LIGHT USING CLEAR-GLASS LAMPS

Lamp Spacing, Inches	Distances to Observer in Feet When the Surrounding Illumination Is Comparatively Bright					Comparatively Dark				
	10 Watt Lamps	25 Watt Lamps	50 Watt Lamps	75 Watt Lamps	100 Watt Lamps	10 Watt Lamps	25 Watt Lamps	50 Watt Lamps	75 Watt Lamps	100 Watt Lamps
	*	*	*	*	*	*	*	*	*	*
3	480	420	*	*	*	290	*	*	*	*
4	630	560	500	*	*	390	330	*	*	*
5	790	700	620	570	*	490	410	*	*	*
6	950	840	740	680	610	590	500	420	*	*
7	...	990	870	800	720	690	580	490	440	*
8	...	...	990	910	820	790	660	560	500	*
9	...	...	...	...	920	880	740	630	570	500
10	...	...	...	...	...	980	830	700	630	550
11	...	...	...	...	...	...	910	770	690	610
12	...	...	...	...	...	...	990	840	750	660
13	...	...	...	...	...	...	...	900	810	720
14	...	...	...	...	...	...	...	970	870	770
15	...	...	...	...	...	...	...	...	940	830
16	...	...	...	...	...	...	...	...	1,000	990

*For distances less than the lowest given in the table, it is impossible to obtain the appearance of a continuous line of light.

Motors and Control

The Control of Blower Motors.—HENRY G. ISSERTELL.—The author has devoted his article to showing how to select the right motor and the right form of control for paddlewheel, centrifugal and multivane types of blowers for the ventilation of several types of buildings.—*General Electric Review*, May, 1922.

Application of Motors and Controls to Printing Plants.—Control of the presses is the most important consideration from the standpoints of economical operation and safety, and it must be 100 per cent efficient. Electric motors and their controllers meet these requirements in every respect, and it is on account of this that nearly all printing plants are motor-driven.—*Electrical Record*, July, 1922.

Heat Applications and Material Handling

Welding a High-Pressure Underground Steam Line.—E. L. HOPPING.—The Philadelphia Electric Company has recently constructed a 12-in. steam and a 3-in. water-return line, about 2,200 ft. in length, in which welded joints were used wherever possible. Methods used and the difficulties encountered are discussed. Oxy-acetylene and metal electric arcs were both employed in the construction work.—*Journal of American Welding Society*, April, 1922.

An Adaptable Electric Steel Company.—S. G. KOON.—By the merging of two forging plants of different characteristics it is expected that the operating schedules of both will fit well together and provide an outlet for certain products which can be made more readily at one plant than at the other and which in some cases will be made from a byproduct of the larger company. A well-illustrated description is given of the furnace and forge installations of each plant.—*Iron Age*, May 4, 1922.

Electrophysics, Electrochemistry and Batteries

The Throwing Power and Current Efficiency of Zinc-Plating Solutions.—W. G. HORSCH and T. FUWA.—The results of a comparison of four distinct types of zinc-plating solutions are given. The effect of modifications in the composition of each type was studied. Using a three-section cathode, the throwing power, cathodic current efficiency and cell voltage were determined for each bath and modification.—*Paper presented before American Electrochemical Society*, Baltimore, April 27, 1922.

Insulating Materials.—Directions for the study of hard composite dielectrics based on the specifications issued by the British Electrical and Allied Industries Research Association in which methods of tests are defined intended for use in the investigation of the mechanical and electrical properties. Materials were included having bases of vulcanized rubber, vulcanized bitumen, shellac and synthetic rosin. The tests include specific insulation resistance, surface leakage and puncture strength, toughness, plastic yield with temperature aging, density and water absorption.—*Beama*, May 1922.

Electrodeposition of Iron.—In view of the extended use of this method for many industrial purposes the Department of Scientific and Industrial Research (England) has issued a report which embodies the results of research carried out by W. E. Hughes. The report gives a description of the deposits, with the effects of temperature, current density and mechanical movement. A theoretical discussion is also given.—*Bulletin No. 6 of the Department of Scientific and Industrial Research (England)*.

Traction

Mercury Rectifier for Railroad.—H. IDELBERGER.—A 210-kw. rectifier has been installed in the power house of Siemensstadt (Germany), to work in parallel with two existing 150-kw. motor-generators. The current demand on this station is exceedingly fluctuating, varying frequently within a few seconds from zero to 900 amp. Including the auxiliary pumps, an over-all efficiency of 90 per cent has been attained, as compared with 61 per cent for the motor-generator sets. The operation of the rectifier is completely automatic, requiring no attendance.—*Siemens Zeitschrift*, May and June, 1922.

Telegraphy, Telephony, Radio and Signals

Fire Alarm and Police Patrol Systems.—A report just issued of the twenty-sixth annual convention of the International Association of Municipal Electricians held last September in Colorado. Among the major papers that were read and discussed were: "The Relation of the National Electrical Code to the Electrical Industry," "Ornamental Street Lighting," "The Value of Modern Fire-Alarm Systems with All-Underground Service," "Comparison of Paper and Rubber Insulation for Fire and Police Underground Cables," "Educating the Public to the Greater Use of the Fire-Alarm System," "Radio Telephone and Telegraph as Used in Fire and Police Signal Systems," and "Modern Electrical Apparatus for Street Traffic Signaling."—*Report of the* 1921 *Convention of International Association of Municipal Electricians.*

The Importance of Higher Voltages for Amateur Spark Communication.—S. KRUSE AND D. W. RICHARDSON.—It has been demonstrated in practice that higher voltages and lower spark pitches are better for spark radio communication using 60-cycle supply. The reason for this is explained, and the conclusion is reached that if proper insulation precautions are taken the most effective spark transmitter for low-wave work will be one using a 60-cycle synchronous spark gap and a transformer with a 28,300-volt secondary whose peak value is 40,000 volts.—*QST*, May, 1922.

News of the Industry

Chronicle of Important Events and General Activities, Announcements and Reports of Association Meetings, Court Decisions and Commission Rulings and News of Electrical Men

Depreciation Provisions of Water-Power Act

Secretary of Power Commission Suggests Amending the Act in Line with Views of N.E.L.A.

IT WILL be necessary to amend the federal water-power act before the depreciation regulation can be altered materially from its present form. This conclusion was reached by the Federal Power Commission at a meeting on July 26. The commission decided that the changes requested by the electrical industries involve a matter of law and are not a matter of policy. It was stated that if the electrical industries continue to believe that relief is necessary they will have to obtain legislation to that end.

As a result of the dissatisfaction with the depreciation regulation, the commission ordered a careful study made of the water-power act, of similar state statutes and of decisions of state courts and commissions which had a bearing on the matter in question. Both the National Electric Light Association and the National Association of Railway and Utilities Commissioners submitted briefs which were considered in connection with the whole subject matter by the chief counsel of the Federal Power Commission and by the law officers of the Departments of War, the Interior and Agriculture.

These law officers agree that, in view of the use of the word "depreciation" in the federal statutes and its definition in decisions of federal courts and of federal and state commissions, the primary purpose of accounting for depreciation under the water-power act is that reserves may be established and maintained sufficient for offsetting the reduction in service value due to accruing depreciation from whatever cause and for maintaining the original investment, unimpaired and adequate for renewing and replacing so far as respects their original costs, units of equipment or structures when their useful lives expire. The chief counsel of the commission holds, and the law officers of the three departments agree with him, that the act as now worded requires an accounting for depreciation substantially as set forth in the existing regulations. It also is held that the definition of "depreciation" proposed by the representatives of the National Electric Light Association and the amendment of the regulation proposed by them with respect to accounting for depreciation are not in conformity with the act. Consequently the commission voted that it is without authority to amend regulation.

O. C. Merrill, the executive secretary of the Federal Power Commission, told the commissioners at the July 26 meeting that he is not convinced that the provisions of the act with respect to depreciation are in conformity with the wisest public policy or that they are in the best interests of the ratepayers in the long run. He expressed the belief that the question should be approached primarily from that standpoint. He suggested to the commission that if upon further consideration it should appear unwise to require the fully accrued depreciation to be taken up on the licensee's accounts, steps should be taken to amend the act.

Mr. Merrill suggested and the commission agreed that it should be optional with licensees whether they account for depreciation on the straight-line or on the sinking-fund basis until the act be amended. A further suggestion by Mr. Merrill also was approved by the commission that he be authorized to confer with the water-power development committee of the N. E. L. A. and others interested, with the view of presenting to the commission proposals for such a degree of flexibility in the annual charges of accruing depreciation as will give due consideration to the maintenance both of the financial credit and of the capital assets of the licensee.

Exemption from Water-Power Act Sought

A systematic attempt to remove the St. Lawrence River project from the conditions imposed by the water-power act is under way, according to Washington reports. The plan is said to be to have the proposed treaty provide that the project is to be conducted under the exclusive jurisdiction of the International Joint Commission. The Swing-Johnson bill proposes to place the Colorado River under the jurisdiction of the Secretary of the Interior, and a well-defined effort to exempt the Columbia River development from Federal Power Commission control is also said to exist. If these efforts should be successful, some contend, the effect will be to repeal the water-power act piecemeal. It is believed that the lack of opposition in both the Senate and the House to the Ford proposal to make Muscle Shoals an exception to the act has encouraged greatly those who would remove from its jurisdiction other conspicuous water powers.

Government Will Direct Distribution of Coal

The President Puts Secretary Hoover in Charge—I. C. C. Issues Priority Orders

THE combination of railroad and coal strikes is bringing matters to a focus at Washington. Stocks of coal are rapidly diminishing, and such coal as is being mined is moved with difficulty if at all. The situation has assumed such a menacing and serious aspect that President Harding has appointed a governmental commission with Herbert Hoover as its chairman to direct the transportation and distribution of the available coal supply.

The Interstate Commerce Commission has issued priority and routing orders effective July 26. Public utilities are listed second in class 2 of preferred consumers of coal. The priority order for public utilities specifies "for public utilities which directly serve the general public under a franchise therefor, with street and interurban railways, electric power and light, gas, water and sewer works; ice plants which directly serve the public generally with ice or supply refrigeration for human food stuffs."

John W. Lieb, vice-president of the New York Edison Company and official fuel representative of the gas, electric light and railway industries, was in conference with Secretary Hoover and other officials in Washington on Tuesday. He says the federal authorities intend to protect the public interests in every possible way by preventing profiteering and undue competition among buyers and by priority for the railroads, other public utilities, etc. M. H. Aylesworth, executive manager of the National Electric Light Association, was in Washington the latter part of the week to watch the interests of electric public utilities.

From all parts of the Middle West reports are coming in of pending shutdowns of small plants due to coal shortage. Every effort is being made to get coal to these stations, and it may be that interruption of service may be avoided. None of the large electric light and power companies of the country is in any immediate danger of coal shortage.

Orders have been placed for hundreds of thousands of tons of British-mined coal for early delivery along the Atlantic seaboard. The Shipping Board is lending its active co-operation in the movement of this fuel.

Sales Managers Confer

Men from Many Cities Discuss the Commercial Problems of the Central Station

THE Sales Managers' Association held its eleventh annual convention on Monday, Tuesday and Wednesday at Association Island, Henderson Harbor, N. Y. Representatives of the sales department of the central-station companies of Baltimore, Boston, Brooklyn, Chicago, Cincinnati, Cleveland, Detroit, Keokuk, Newark, New York, Long Island City, Philadelphia and Washington were in attendance. R. R. Young, Newark, N. J., was chairman. An exceedingly well-balanced program of commercial subjects was provided.

R. S. Hall, Boston, read a paper on merchandising and wiring by central stations in which he emphasized the importance of the central station avoiding unfair competition; F. D. Pembleton, Newark, discussed the opportunities for co-operation between central stations, contractors and dealers and the great work waiting to be done by constructive publicity; J. F. Gaskill, Philadelphia, presented an analysis of the competitive costs of energy in ice plants, showing by graphs the good influence of this class of load on the power company's annual business cycle; C. K. Nichols, New York, submitted a report on the comparative performance of different types of domestic refrigeration; A. A. Pope, New York, read a paper on commercial department relationships which described in detail the operation of the organization of the New York Edison Company, and Miss F. M. Sheridan, Detroit, reported progress in her study of the comparative expense of sales departments, the situation being still incapable of accurate analysis because of the lack of comparable standards.

The ten most important opportunities for business development at present, according to a paper by R. H. Tillman, Baltimore, are offered by pumps and compressors, ventilating equipment, steam boilers, color display lighting, construction equipment, material handling, electric trucks, railway electrification, electrochemical applications and refrigeration.

H. B. Brown, Philadelphia, described the success of the mail-order type of advertising which has been employed by the Philadelphia Electric Company, and O. R. Hogue, Chicago, outlined the recent experience of the Commonwealth Edison Company in industrial and commercial lighting.

Service to Outlying Communities

An interesting new plan for supplying electric service to outlying communities was covered in a paper by G. E. Miller, Cleveland, which described a system now in force and serving several towns from the lines of the Cleveland Electric Illuminating Company. Under this plan the community constructs its own distribution line for connection to the power supply, the company providing transformers and meters and having the right to extend to other towns lying beyond.

E. W. Lloyd, Chicago, outlined the new-business program of the Commonwealth Edison Company and described the present plans of the joint committee for business development, of which he is chairman.

A further report of the recent activities of the greater service department of the Southern California Edison Company was submitted by S. M. Kennedy, Los Angeles, who was unable to be present.

Three topics were presented for general discussion, the problem of the minimum bill to the residence consumer, the question whether utility companies should take the public into fuller confidence regarding company problems, accomplishments and development, and the value of sales manuals for instructing employees in company policies and methods.

The following executive committee was elected for the ensuing year: L. R. Wallis, Boston; H. K. Mohr, Philadelphia; J. D. Noyes, Detroit.

Georgia Senate Rejects State Water-Power Plan

The Georgia State Senate's committee on constitutional amendments has discarded by a vote of ten to one the water-power bills proposed by the Municipal League of Georgia. In substance these bills provided for the appointment of a commission to investigate the water powers of the state with a view to state-wide development.

N. E. L. A. Executive Meeting

Encouraged by its success in obtaining revisions downward of the fire insurance premiums paid by electric light and power companies, the insurance committee of the N. E. L. A. will turn its attention during the present administrative year to the question of securing reductions in the casualty insurance premiums paid by electric light and power companies, according to the report made at the first meeting of the newly elected national executive committee of the association, held at headquarters in New York last week. S. E. Wolff, former chairman of the committee, reporting on behalf of the present chairman, Charles B. Scott, said that the reductions in fire insurance premiums secured would total more than $400,000 a year, and that at least that amount will be saved to member companies if the committee is successful in obtaining similar revisions in casualty insurance premiums.

John W. Lieb reported for the joint fuel committee of the electric, gas and street railway utilities, as noted on another page.

President Smith stated that in all probability N. E. L. A. representation upon the joint committee on inductive co-ordination, which last year was the joint general committee on inductive interference, will be the same as last year, with the addition of himself as an ex-officio member.

The executive committee decided that the *Proceedings* of the 1922 convention at Atlantic City shall be published in four volumes.

Do Terms of Water-Power Permit Govern?

Counsel of Federal Commission Holds That Compliance with Them Makes Issue of License Obligatory—Judge Advocate General Says Commission May Alter Them

IN AN opinion rendered to the executive secretary of the Federal Power Commission, Col. Lewis Call, chief counsel of the commission, has ruled that the holder of a preliminary permit is entitled to a license under the conditions set forth directly or indirectly in the preliminary permit. As the preliminary permit is issued in accordance with the provisions of the federal water power act and the regulations of the commission issued thereunder, he holds that these constitute a part of the permit, and whatever conditions are prescribed in the statute or in the regulations, though not specifically set forth in the preliminary permit, nevertheless are included by inference. He also holds that if the permittee complies with the conditions directly or indirectly expressed in his permit and is willing to accept a license on the conditions set forth in the permit, he is legally entitled to the license.

The opinion was rendered in response to a request from Executive Secretary Merrill for answers to the following questions:

1. "If a preliminary permit is first issued and such permit is to be followed by license, can conditions be inserted in the license which were not expressed directly or indirectly in the preliminary permit?

2. "If a preliminary permittee has complied with all the provisions directly or indirectly expressed in his permit, which are conditions precedent to issuance of license, and if he also is willing to accept a license containing all the provisions directly or indirectly expressed in his permit, which are to be conditions of such license when issued, has the commission authority to refuse to issue a license or to make its approval conditional upon the acceptance of other or additional provisions?"

In his opinion Colonel Call points out that the act provides for the issuance of preliminary permits for the purpose of enabling applicants for license to secure the data and perform the acts that are required by the law as conditions precedent to the issuance of a license to the permittee.

Section 5 of the act states that each preliminary permit is "for the sole purpose of maintaining priority of application for a license," and that it shall be issued "for such period or periods not exceeding a total of three years as in the discretion of the commission may be necessary for making examinations and surveys, for preparing maps, plans, specifications and estimates and for making financial arrangements," and that "each such permit shall set forth the conditions under which priority shall be maintained and a license issued."

Colonel Call contends that the provision of the act which allows a permit to be canceled upon the failure of the permittee to comply with the conditions of the permit implies that it may not be canceled for any other reason. He holds that the requirements as to written notice of application and of advertising is to insure that all objections to the issuance of a preliminary permit may be brought before the commission and considered before the permit is issued.

He also points out that the permit must set forth the conditions under which priority shall be maintained and the conditions under which a license shall be issued. The former provision, he believes, is for the express purpose of requiring the permittee to make examinations and surveys and take the other necessary steps so that he shall be in a position to proceed with his project when the license is issued. The evident purpose is to protect the permittee in the investment, frequently aggregating many thousands of dollars, necessary to the making of preliminary investigation. The provision also assures him that he may safely proceed with his investigations and his financial arrangements in the certainty that if he complies with the conditions expressed in his permit he will in due course receive a license.

JUDGE ADVOCATE GENERAL DISSENTS

The Judge Advocate General of the War Department, however, holds that the preliminary permit is issued for the sole purpose of maintaining priority of application for license, and that the commission has the power, in order to secure the project best adapted to develop, conserve and utilize in the public interest the navigation and water resources of the region in question, to impose conditions in the license not expressly appearing in the permit.

The Judge Advocate General also holds that, even though a preliminary permittee has complied with all of the conditions of his permit and is willing to accept a license upon the terms contained in the permit, the commission may make its approval conditional upon acceptance of other or additional provisions, provided such conditions are for the purpose of securing the fullest development of the public resources under the terms of the act.

The commission at its meeting on July 26 decided to refer the conflicting opinions to the Attorney-General.

Burlington Company Offers to Lease Municipal Plant

Closer co-ordination of the electrical generating and distribution facilities at Burlington, Vt., is forecast in an offer by the Burlington Light & Power Company to lease the municipal electric lighting plant of the city for a period of twenty years and operate it in conjunction with its existing steam and hydro-electric stations. D. W. Jardine, local manager of the Burlington company, informed a representative of the *Electrical World* this week that the company offers to pay $40,000 per year rental for the plant and also to extinguish $200,000 in bonds on the installation at the end of the lease.

The municipal plant has a present peak load of about 750 kw. and, besides furnishing energy for the street lighting and city pumping, supplies commercial customers from an overhead distribution system of moderate size. The Burlington company is completing important underground work in the heart of the city and operates 10,000 kw. in steam and hydro-electric stations, with an interconnection into the Montpelier-Barre district. During the past two years the municipal plant has been purchasing energy at 1 cent per kilowatt-hour from the Fairfax plant of the Public Electric Light Company of St. Albans, on the Lamoille River, this being transmitted to Burlington at 33,000 volts. About 2,000 kw. is available from this source under the present agreement.

European Power-Plant Engineering Shows Influence of Manufacturers

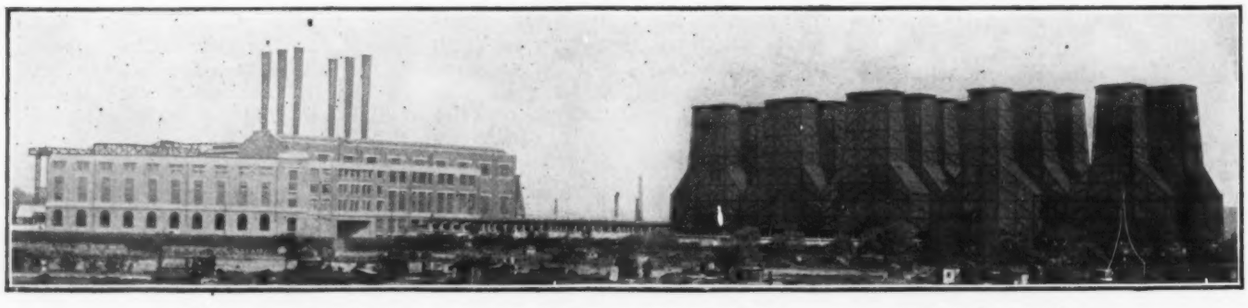
Recently Returned American Engineer Gives Impressions Regarding Practice in Great Britain and France—Ejector Draft and Economizer Employed Extensively—Air Preheaters Coming Into Use

SOME interesting observations regarding the development of electric light and power companies abroad were made by C. W. E. Clarke, power engineer for Dwight P. Robinson & Company, Inc., who recently returned from a brief tour of England and France.

"One not acquainted with the conditions surrounding the electric light and power industry in England and on the Continent," said Mr. Clark, "is apt to meet with a succession of surprises because of the lack of similarity in methods and also because central-station development in those countries is at a decidedly earlier stage than ours. Greater London, for example, instead of having a few large central stations, is supplied with light and power from more than forty separate plants. The majority of these are operated by means of cooling towers. The largest plant in the London district and one of the largest in England is the Lots Road station of the London Electric Railway Company, with a total capacity of 83,000 kw., consisting of six 8,000-kw., one 15,000-kw. and one 20,000-kw. machine, the two last named just recently installed.

"Another plant, of interest because of its stoker installation, is the Wolverhampton Corporation Electric Supply plant at Wolverhampton. The design is somewhat different from the usual type of chain grate, inasmuch as it has its own fans mounted on the stoker frame with fans and grate operated by one motor. This makes a very attractive and self-contained unit.

"The Birmingham Corporation Electric Supply Company is completing a new plant called 'Nechells,' which is to have an ultimate capacity of 105,000 kw., the first installation consisting of two 15,000-kw. units. The plant is to be operated with cooling towers. The steam pressure will be 325 lb. with



COOLING TOWERS ARE USED EXTENSIVELY IN EUROPEAN POWER STATIONS (NECHELLS PLANT)

superheat at 272 deg. F. In accordance with the usual practice abroad, the boilers are fitted with economizers. Draft is produced by discharging a fairly high-pressure blast of air through ejector nozzles in the center of the stack. This plant is also equipped with so-called 'ironclad' switch gear. Buses and all connections to switches are run in steel, box-shaped conduits, which are filled with insulating material after the buses are installed.

"The Manchester Electric Supply Corporation is building a new station at Barton, which should prove to be an interesting development since it is one of the newer designs and contains, among other up-to-date features, a very complete heat reclamation system. The station is designed to contain three 25,000-kw. turbo-generators at present.

"I had the pleasure of going through the works of the Metropolitan Vickers Company, a large turbine-manufacturing concern at Birmingham. In my opinion the products of this company, especially the turbo-generator units, are the finest in Europe, and I question if they are not better in some features of design and construction than the turbines in this country. One novel feature is the provision for steam extraction for feed-water heating by installing the heater as an integral part of the turbine base.

"The Dalmarnock station at Glasgow is a relatively new development, with an ultimate capacity of 200,000 kw. The present plant operates under 275 lb. steam pressure and 300 deg. F. superheat. In my opinion this is the best plant I saw in England. It is operated under commercial load at a heat consumption of 18,500 to 19,000 B.t.u. per kilowatt-hour, with coal containing about 12,000 B.t.u., a very good record, especially when it is considered that the yearly load factor is less than 30 per cent.

"In France I inspected four stations, all in the environs of Paris, namely, the Saint-Denis, Saint-Ouens, Issy les Moulx and Gennevilliers stations. The main interest in the first three stations lies in the use of the Belleville type of boiler, a rather remarkable piece of equipment and so unlike a boiler as we know it as to cause remark from Americans. The tubes are threaded into the tube header and further held in place by lock nuts. The most interesting station in Paris is the new Gennevilliers station,* designed to contain 200,000 kw. ultimately. Three 40,000-kw. units are now installed. This station is more American than any other on the Continent and shows the earmarks of the designer's visit to this country about three years ago. Unless trouble is encountered with the condensing equipment, which looks rather small, I expect this station to prove to be one of the best in Europe. It is especially noteworthy because of the large size of units and the air preheaters with which the boiler plant is equipped. This is the largest installation ever attempted along these lines, and the results should prove interesting. The boiler plant is arranged with three parallel lines of boilers, two rows of Babcock & Wilcox with chain grates and one line of large Stirlings, double-fired by Riley stokers. The Babcock & Wilcox boilers are set rather low, but the Stirling units have very fine combustion space provided for them.

"Both in England and on the Continent, in central-station work especially, one sees the mark of the manufacturer rather than of the engineer, the latter apparently accepting without very much question the opinion of the manufacturer as to how apparatus should be installed and utilized. This is particularly apparent in the setting of

C. W. E. CLARKE

boilers, which are still set very low with small combustion spaces. It is not uncommon to see a 1,500-hp. boiler set with the front header 8 ft. or 9 ft. from the floor, whereas today 15 ft. to 20 ft. would be considered good American practice.

"The almost universal use of economizers is another noticeable point of departure from our practice, for their installation is apparently in no way controlled by load conditions, cost of fuel, etc. The use of air heaters is becoming more general, although I saw no good representative installations of heaters in operation. Several are under construction, however.

"The European method of rating boilers is another point of departure from our custom, inasmuch as they base ratings on evaporative capacity, a logical method except where a boiler is designed for a certain number of square feet of heating surface. In this case, owing to variant ideas of builders as to what constitutes good practice in terms of evaporation (in pounds of water) per square foot of heating surface, the relative evaporation rates might be radically different.

"Some of the structural steel designs used abroad are worthy of comment. Apparently there is a very general tendency to use heavy rolled shapes in designing columns and beams, while from our point of view the use of plates and angles would be better practice. In the construction of large steel-skeleton buildings the sides are covered for the full height with temporary scaffolding. Apparently the present-day hanging scaffoldings widely employed in this country are not used. However, the builders in England are in the hands of the Board of Trade, a rather arbitrary governmental organization, which sometimes does not permit the use of methods or devices which we consider good practice."

Mr. Clarke states that every courtesy was extended to him by the engineers of France and England. However, he was not allowed to see the North Tees power station at Newcastle. Merz & McLellan, the engineers, declared that the station, although it had been in commercial operation for some time, was not yet fully in commission. Furthermore, the Newcastle-on-Tyne Electric Supply Company has made it a rule to admit no visitors to the station until the whole of the plant shall have satisfactorily passed the specified tests.

*See frontispiece in July 15, 1922, issue of the *Electrical World*.

J. W. Lieb Reports to N. E. L. A. on Fuel Situation

One of the most important matters to come before last week's meeting of the new executive committee of the National Electric Light Association was a summary by John W. Lieb, chairman of the joint fuel committee of the N. E. L. A., the American Gas Association and the American Electric Railway Association, of the activities of that committee, which took over the coal situation when the National Committee on Gas and Electric Service was discharged more than a year ago. Mr. Lieb stated that as a result of a warning notice sent out from the three associations in January, followed by additional letters containing information on the coal situation, the public utilities of the country undoubtedly were in better shape so far as coal reserves are concerned than any other class of industry. Questionnaires sent out by the three associations a month ago resulted in replies showing that the utilities as a whole had between thirty and forty days' supply of coal on an average, the electric light and power companies at that time having fifty days' supply.

Mr. Lieb said that virtually all companies are now in the spot coal market purchasing at increased prices in order to maintain existing reserves, although every effort is being made to get coal as cheaply as possible.

Of particular interest to members present who operate steam properties at or near tidewater was Mr. Lieb's statement that several hundred thousand tons of British coal had been ordered by utilities and industries of this country for delivery within the next two months. This coal is now available at from $7.25 to $7.75 per ton f.o.b. American ports.

Pulverized Fuel for St. Louis Plant

Splendid Location Near Low-Grade Fuel Source —No Stack Trouble—Fuel Equipment Part of Boiler Setting—Plan Held Cheapest and Best

THE decision to use pulverized fuel in a large central station, after careful analysis of costs, shows that engineering of power plants is still in the process of evolution. As mentioned in last week's issue of the *Electrical World*, the new Cahokia plant of the Union Electric Light & Power Company in St. Louis will have its initial installation of eight boilers equipped with pulverized-fuel apparatus, which will be supplied by the Combustion Engineering Corporation.

The reasons given by McClellan & Junkersfeld, the consulting electrical engineers, for the use of this fuel are:

1. An annual coal consumption lower than with the best of a number of stokers tested and investigated is assured.

2. A net saving is made in operating cost by reason of the relative cost of maintenance, banking and pick-up losses, ash disposal and pay-roll.

3. Increased operating convenience is gained both for normal load and for quickly added loads.

4. The fixed charges on pulverized-fuel equipment and building are no greater than those on stoker equipment and building.

5. Owing to the location of the plant, there is no question of trouble from stack ash.

6. Operating reliability of the equipment is unquestioned, while low-grade fuel can be burned and oil can be quickly substituted for coal if desired.

The increased efficiency of combustion with the use of pulverized fuel was the biggest of several factors. Moreover, this plant is about 20 miles from a mining region where low-grade fuel can be obtained at about $2.50 per ton. In the opinion of Peter Junkersfeld, slagging and troubles with pulverized fuel are as preventable as with stokers and have have been eliminated to a large extent by careful design.

The decision on the plant fuel equipment was reached only after exhaustive tests and investigations had been made throughout the country. One of the most important installations studied was that of the Milwaukee Electric Railway & Light Company.

The new plant will cost about $6,000,000 and will be built on the Illinois side of the Mississippi at St. Louis.. This location was chosen because it is the load center, because it eliminates all bridge or switching charges for fuel transportation, and because service can be obtained from several railroads. In addition, no possible trouble can result from chimney discharge.

At present there are being installed two 30,000-kw. turbo-generators—one General Electric and one Westinghouse —but the ultimate development will consist of eight units. The two units are supplied with steam from eight boilers of about 18,000 sq.ft. heating surface with steam at the throttle having a pressure of 300 lb. at a temperature of 690 deg. F.

The condensers for the units will be placed in pits because of a 45-ft. variation in high and low water in the river. Each pit will contain two condensers, with a twin intake tunnel and a single discharge tunnel. The boilers will be without economizers and will be eighteen or twenty tubes high, with a very deep combustion chamber specially designed as to setting and arrangement to burn pulverized fuel having about 17 per cent ash content. The pulverized-fuel equipment is part of the boiler, takes the same space and is arranged like a stoker installation, as part of the boiler room.

All auxiliaries will be electrically driven. Feed water will be heated by bleeding from main units with exhaust from a house turbine for maintaining a heat balance.

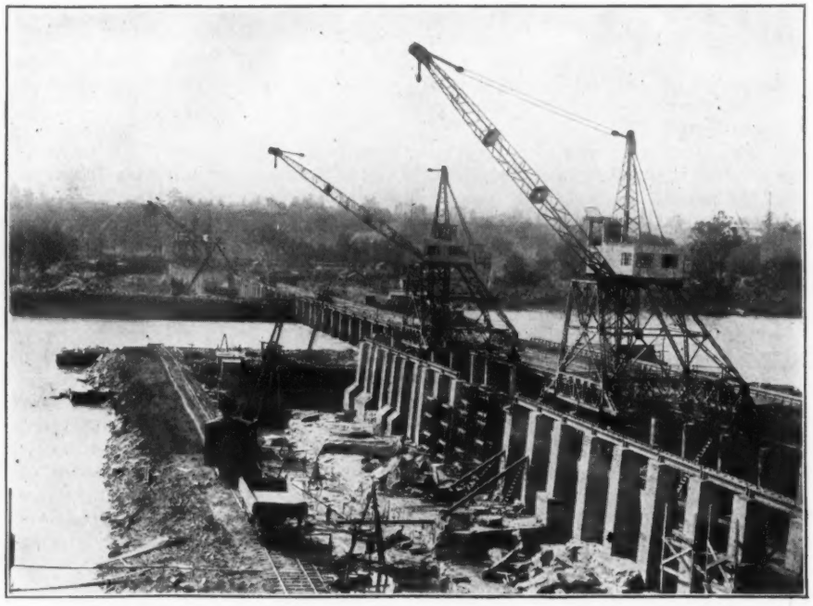
Another feature of the plant is that uture units can with equal convenience be equipped either for pulverized fuel or for stokers. This arrangement arose from the fact that the original design of the station was predicated on using either type of equipment. Improvements may be expected in the development of stokers as well as in pulverized-fuel equipment, but stokers have been under development for a long period of years and the burning of coal in pulverized form in large quantities by central stations has been done only in the last few years. Without attempting to estimate future developments in the two classes of equipment for burning coal, the consulting engineers state that at least the present relative position, so far as the Cahokia station is concerned, will probably be maintained.

Powdered Coal in Arkansas

Following a successful experiment in operating a power plant with powdered coal as fuel, the Arkansas Light & Power Company plans to install a large plant of this type at Russellville, Ark., connecting it by high-tension lines with the company's plants at Pine Bluff and Picron. The Russellville plant of the power company has been closed down for several days, energy for Russellville, Dardanelle, Atkins, Morrillton and Plumerville being supplied from the powdered-coal plant at the mines of the Southern Anthracite Company, south of Russellville. According to B. C. Fowles, manager of the power company, the powdered-coal plant will furnish power during the summer months, except on Saturday nights, when the Russellville plant will be operated.

The powdered-coal plant, which was installed as an experiment, is declared to be a complete success. The Pine Bluff plant supplies the rice fields in the Grand Prairie district, its peak load for pumping purposes being from June to September. Cotton gins in other sections demand a peak load during the fall and winter months. With the three plants connected, it is said they will equalize the demand for power throughout the year.

Army Engineers Resume Work on the Wilson Dam



Immediate work in continuation of the construction of the Wilson Dam at Muscle Shoals, Ala., by army engineers will be possible by the use of unexpended appropriations of $230,000. This sum will be supplemented Oct. 1 by the $7,500,000 recently authorized by Congress.

Hydro-Electric Plans for Central Chile

British Engineers Report Favorably on the Development of the Colorado and Maipo Rivers —A Total Development of 100,000 Hp. Projected

CHILE has a Colorado River of her own. This stream and another, the Maipo, have lately been explored with respect to their hydro-electric potentialities by two British engineers, F. S. Badger, who represents J. G. White & Company, and Norman Rowe. Plans based on the favorable report of these engineers are, according to the Trade Supplement of the London *Times*, being made for the exploitation of these water powers by a new enterprise, which also purposes the purchase and amalgamation of a number of existing undertakings such as the Chilean Electric Tramways & Light Company and the Compañia de Fuerza Electrica de Santiago. From the *Times'* report these details of the projected hydro-electric development are taken:

The first plant to be erected will consist of three, and subsequently of four, generating units of 10,000 hp. each. The available head is 590 ft., and the main canal will be about 25,000 ft. in length. On account of the large amount of silt brought down by the Colorado and Maipo Rivers, the expedient of storing water by means of a dam was not thought suitable, and instead it has been decided to construct a reservoir in a natural depression in the hillside.

Electrical energy will be generated at 6,600 volts, 50 cycles, three-phase, and transformed to 110,000 volts for transmission. The transformers and 110,000-volt switchgear will be of the open-air type and will be installed outside the power station, but the controls for the 110,000-volt oil switches will be mounted on the main switchboard inside the power house, in conjunction with the controls of the 6,600-volt switches, all switches being worked electrically by remote control. For additional security and ease of operation, both the 110,000-volt and the 6,600-volt busbars will be in duplicate, and the transmission lines will also be in duplicate.

Carried on double-circuit steel towers, the line to Santiago will at first consist of two circuits of copper conductors, the insulators used being of the suspension type and the normal spans 61 ft. From Santiago the line will be continued on one set of double-circuit towers and pass through Polpaico, over the Pass of Domida, to Limache and Valparaiso. It is intended to construct a substation at Santiago in order to supply the Electric Tramways & Light Company, as well as other local consumers, while a further substation will be erected at Tiltil to supply the demand in that locality, including the necessary power for the operation of the State Railways over a heavy grade.

These works are merely intended to serve as a nucleus of a much wider and more comprehensive scheme of hydro-electric installations. Rights have been acquired to utilize other natural water resources, such as a portion of the Maipo River which runs through a deep and narrow gorge and affords an almost ideal site. At Puente de Cristo there is to be constructed a hydro-electric station capable of producing 65,000 hp., and when these works, together with others in contemplation, have been completed, the central region of Chile will have command of more than 100,000 hp. supplied from hydro-electric sources.

Newspaper Men Visit Pit River

More than sixty California newspaper men spent three days inspecting the Pit River developments of the Pacific Gas & Electric Company recently. The writers were guests of the company and reported an enjoyable time. A year ago the plant was started and now the power house, costing upward of $6,000,000, is nearing completion. The plant will develop 93,000 hp. when completed and will be ready for operation about Sept. 15. A 220,000-volt transmission line 210 miles long will connect the plant with the Vacaville substation, and 70 miles must still be covered by another line before San José Mission is reached and the power is delivered at San Francisco.

The whole Pit River development is expected to reach completion in 1935, at a cost of more than $100,000,000, or an annual expenditure of about $8,000,000. The power developments mapped out are: Pit No. 2, 23,500 hp.; Pit No. 3, 90,500 hp.; Pit No. 4, 107,200 hp.; Pit No. 5, 250,000 hp.

Southern California to Save 1 per Cent in Financing

Stockholders of the Southern California Edison Company are to vote on Aug. 1 on a plan for rearranging the capitalization of the corporation which will make junior financing cheaper and thus bring about a saving of 1 per cent or more in the cost of money raised by the company. In announcing the new plan to the stockholders President John B. Miller says:

"The company's general policy is to provide the major part of its new construction needs through the sale of bonds and the remainder by capital stock. Heretofore common stock paying 8 per cent dividends has been sold. It is now proposed to substitute a stock limited to 7 per cent dividends for future sales, thus resulting in the company securing funds at 1 per cent less than formerly, with resultant benefit to present stockholders. This plan will make additional funds available for dividends on the stock outstanding.

"Through the unprecedented distribution of common stock among the people of southern and central California the company is now in a most enviable position. In 1917 it adopted the policy of having a large number of partner stockholders with the result that between 1917 and the present date there has been sold about $35,000,000 common stock and the number of stockholders has been increased from less than 2,000 to over 47,000. This splendid result makes possible a rearrangement of the company's capitalization to provide for future financing at less cost, which should provide a greater surplus available for dividends on common stock."

Brief News Notes

American Public Service Extends Lines.—The American Public Service Company has completed arrangements for building high-tension lines into McCauley, Sylvester, Plastico and other towns along the Kansas City, Mexico & Orient Railway in west Texas, according to announcement by P. P. Sheppard, its representative. Electric energy for lighting and power will be made available to these towns.

Oshkosh Has "White Way."—On July 4 the Mayor of Oshkosh, Wis., threw the lever that supplied energy to 230 new ornamental street lamps in the business section. The official opening was in the power house of the Oshkosh Gas Light Company and was attended by officials of that company, of the Monroe Electric Company of Chicago, which installed the lights, and of the Oshkosh Association of Commerce. The Association of Commerce was instrumental in getting the new system for the city.

No Conflict Over Ohio River Development.—The Louisville Gas & Electric Company will not enter into any controversy with the city of Louisville regarding the power site at the falls of the Ohio River, according to a report from the Kentucky city. The company, it is announced, will lay its claims before the Federal Power Commission's examiners at the same time that the city's claims are presented. The commission has issued a statement that the examiners will soon hold hearings in Louisville. "The city of Louisville," the commission reports, "has made application for power development at the proposed reconstructed dam in the Ohio River at the Falls of the Ohio, near Louisville. The city proposes to use the power for municipal purposes and to sell it for public utility purposes in Louisville and adjacent municipalities. The application is in conflict with Project No. 1,289, an application for a preliminary permit from the Louisville Hydro-Electric Company." The latter company is a

subsidiary of the Louisville Gas & Electric Company. The power will not be available, it is said, for ten years, as the construction of a plant and dam at an expenditure of about $12,000,000 is necessary. A steam plant will also be required to assure a continuous supply of power.

New Station at Merrimack, Ala.—The Alabama Power Company has erected a new primary substation at Merrimack, near Huntsville, tripling its power output at that point. It is reported that another large cotton mill is to be erected at Merrimack, and the power facilities now provided are declared to be ample to care for the needs of any new industries which may be established.

Camden-Atlantic City Line Buys Philadelphia Power.—Electricity bought from the Philadelphia Electric Company will be used to furnish the power of the West Jersey & Seashore Railroad's third-rail line from Camden to Atlantic City. An agreement has been reached between the Pennsylvania Railroad, which controls the West Jersey, and the electric company by which the Pennsylvania Railroad will run a transmission line across its Delaware River Bridge and connect with the West Jersey in Westville.

Central Maine Purchases Freeport Company.—A decision has been given by the Public Utilities Commission of Maine approving the petition of the Central Maine Power Company and the Androscoggin & Kennebec Railway Company for the sale of the former properties of the Freeport Electric Light, Heat & Power Company by the Androscoggin & Kennebec Railway Company to the Central Maine Power Company and authorizing the Central Maine Power Company to furnish its service in the town of Freeport. The price paid was $20,000.

New England Bureau of Public Service Information Plans Expansion of Service.—A New England "Primer of Public Utilities" has been prepared for distribution this fall by the New England Bureau of Public Service Information, according to the first annual report of Joseph B. Groce, director of the bureau. The New England bureau covers six states. Thirty-seven bulletins have been issued since the inauguration of bulletin service to the press, to executives of subscribing companies, to chambers of commerce, banking houses and public libraries in October, 1921.

The Scottish Highland Electricity Supply Scheme.—Under the Grampian hydro-electric project now before the British Parliament the development company would tap the water power available within an area covering 417 square miles in the northern part of Perthshire. About 56,000 continuous horsepower would thus be made available for the whole of central Scotland. There would be four power houses—one on the Tummel River, rated at 17,400 hp.; one at the western end of Loch Rannoch, rated at 26,900 hp.; one on the Garry River, rated at 7,500 hp., and one on the Bruar, rated at 4,200 hp. Electrification of the Highland Railway is contemplated. The total cost of carrying out the scheme, says the London *Engineer*, is put at £4,500,000.

Water Power on the Spanish-Portuguese Border.—Utilization of the power resources on the rivers forming the boundary between Spain and Portugal has been brought nearer, says the American Consul at Oporto in a report to the Department of Commerce, by the beginning of operation of the plant of the Compañia Electro del Lima at the falls of the Lima River, on the frontier. The development of the important power resources of the Douro River, an international stream, has been prevented by the inability of the two countries to agree on the distribution of the power. The Lima project is being handled by a company owned jointly by Spanish and Portuguese interests. The Spanish interest is held by the Hidro-electrica Hispañola, which is one of the two large hydro-electric companies operating in Spain. The Portuguese interest is held by the banking firms of Pinto and Setto Maior. The success which apparently is accompanying the Lima development is expected to pave the way for more important developments on the Douro.

British Scheme to Consolidate Power Supply Is Making Progress.—Fourteen districts have been mapped out by the electricity commissioners under the electricity supply bill, which is intended to reorganize the entire system of distribution for Great Britain, according to the American Consulate at London. The districts already defined are Lower Severn, West Lancashire, West Riding of Yorkshire, Mid-Lancashire, Southeast Lancashire, North Lancashire, North Wales, London and home counties, Northwest Midlands, Northeast Midlands, South Wales, Southwest Midlands, East Midlands and West Scotland. Prior to 1919 the supply of electricity in England was in the hands of more than 500 concerns, located in various parts of the country and each having its own area. Conditions have been especially bad in and about some of the larger English cities where numbers of these smaller plants endeavor to operate as central stations, each supplying a small area, at different voltages and frequencies. The city of London is at present supplied with electricity by about seventy different stations. In most of the new districts modern large-capacity stations will have to be built. The first of these is to be erected by the County of London Electricity Company, at Parking, Essex, and will be used to reinforce the supply for Greater London. Each of the new capital stations will cost upward of £3,000,000 and will be so designed as to allow enlargement to meet increasing demand. It is probable that the next ten years will see the number of central stations in England reduced to about a score.

Associations and Societies

National Radio Chamber of Commerce.—This organization held its first annual meeting at Washington on Wednesday, Thursday and Friday of this week. Among the speakers announced were Secretaries Hoover and Weeks, Gen. G. O. Squier, Dr. S. W. Stratton and M. C. Rypinski.

Chicago Section, A. I. and S. E. E.—The final meeting of the Chicago Section of the Association of Iron and Steel Electrical Engineers was held on June 20 during a boat trip down the Sanitary Canal en route for an inspection trip through the power plant at Lockport, Ill. The following officers were chosen for the coming year: President, Charles Donovan, American Sheet & Tin Plate Company, Gary, Ind.; vice-president, Henry E. Davis, Interstate Iron & Steel Company, South Chicago, Ill.

Coming Meetings of Electrical and Other Technical Societies

A complete directory of electrical associations is published in the *Electrical World* in the first issue of each volume. See July 1 issue for latest list.

A. I. E. E., Pacific Coast Convention—Vancouver, B. C., Aug. 8-11. F. L. Hutchinson, 33 West 39th Street, New York, N. Y.

Michigan Electric Light Association—Ottawa Beach, Aug. 21-23. Herbert Silvester, Edison Bldg., Ann Arbor, Mich.

International Association of Municipal Electricians—New Bedford, Mass., Aug. 22-25. C. R. George, Houston, Tex.

New York Electrical League—Association Island, Sept. 5-7.

N. E. L. A. Geographic Divisions — New England, New London, Conn., Sept. 5-8; Southeastern, Atlanta, Sept. 12-15; Rocky Mountain, Glenwood Springs, Col., Sept. 18; Great Lakes, French Lick Springs, Ind., Sept. 28-30. M. H. Aylesworth, 29 West 39th Street, New York.

Pennsylvania Electric Association—Bedford Springs, Pa., Sept. 6-9. H. M. Stine, 212 Locust St., Harrisburg, Pa.

Association of Iron and Steel Electrical Engineers—Cleveland, Sept. 11-15. J. F. Kelly, Empire Bldg., Pittsburgh, Pa.

American Electrochemical Society — Montreal, Sept. 21-23. A. D. Spillman, Columbia University, New York City.

Illuminating Engineering Society—Swampscott, Mass., Sept. 25-28. Samuel G. Hibben, 29 West 39th Street, New York.

American Institute of Mining and Metallurgical Engineers—San Francisco, Sept. 25-28. F. F. Sharpless, 29 West 39th Street, New York.

National Association of Railway and Utilities Commissioners — Detroit, Sept. 26. J. B. Walker, New York Transit Commission, New York.

Illinois State Electric Association—French Lick Springs, Ind., Sept. 28-30. R. V. Prather, 305 Illinois Mine Workers' Bldg., Springfield, Ill.

Indiana Electric Light Association—French Lick Springs, Ind., Sept. 28-30. Thomas Donohue, Lafayette, Ind.

American Electric Railway Association — Chicago, Oct. 2-6. J. W. Welsh, 8 West 40th Street, New York.

Empire State Gas and Electric Association —Lake Placid, Oct. 5-6. C. H. B. Chapin, Grand Central Terminal Bldg., New York.

Association of Edison Illuminating Companies—New York City, Oct. 11-14. Preston S. Millar, 80th St. and East End Ave., New York.

National Association of Electrical Contractors and Dealers—Cincinnati, Oct. 9-14. F. Johnson, 15 West 37th St.

Electric Power Club—Asheville, N. C., Oct. 30. S. N. Clarkson, 506 Laclede Gas Bldg., St. Louis.

Commission Rulings

Service Charge Substituted for Meter Rental.—Declaring a rental charge for meters illegal, the Wisconsin Railroad Commission has ordered the Princeton municipal electric light department to repurchase at present values meters sold to consumers and to impose a service charge of 15 cents a month per meter in place of the rental charge.

Taxes on Bonds.—Taxes on bonds paid by a public utility company must not, the Pennsylvania Public Service Commission declared in a complaint against the Lewiston-Reedsville Water Company, be charged to operating costs. Assuming such taxes is in effect paying an increased interest rate on borrowed capital, and such a payment cannot be passed on to the public.

Basis of Energy Sales by Municipality to Utility.—A municipal electric plant supplying electricity at wholesale to a public utility should, the Wisconsin Railroad Commission decided in passing on an application from the village of Embarrass, bill the company on the basis of the reading of a master meter rather than the readings of individual meters. In view of transformer losses, however, the commission reduced the rate from 8 cents per kilowatt-hour to 5 cents, the regular power rate of the village.

Commission Has No Duty to Protect Company Against Loss from Unfortunate Contract.—Declaring that the province of the commission is to "safeguard the interests of the public," the New Hampshire Public Service Commission refused to change an unprofitable contract rate made by the Antrim-Bennington Electric Light & Power Company with a manufacturing company, saying: "Where the utility enters into a contract to furnish service at a rate lower than is provided by its regular schedule and it is found that the performance of this contract will necessarily work a hardship on the other consumers by either increasing their rates or impairing the service, then the commission should terminate the special contract, even though it was approved by the commission when entered into. But where the enforcement of the contract results simply in a decrease of the net return to the owners of the property and has no injurious effect on the general public, the contract should not be set aside. It is not the duty of the Public Service Commission to protect the owners of the public utility property against the consequences of an unfortunate contract voluntarily entered into by them. There is no reason why they should not abide by the consequences of their acts so long as the public is not adversely affected."

Grouping Communities for Rate Making.—The Wisconsin Railroad Commission, approving the division of the territory of the Wisconsin Gas & Electric Company into sections according to the character of territory served, said: "That the rates charged should vary with the density of the territory served must be expected if these rates are to be in keeping with the costs of serving the various communities. With a very large number of communities to supply with energy, it is not practicable to serve each under a different set of rates. Divisions are, therefore, resorted to which include all territory whose energy consumptions are similar and to which the same schedule of rates can logically be applied. The differentials between the rates of the various groups are designed to represent as closely as possible the average differences in the costs of service."

Attaching Transformers to Commission Lines Condemned.—Maintaining that the practice of attaching a transformer directly to an 11,500-volt transmission line to serve patrons with 110 volts or 220 volts is not good engineering practice, the Pennsylvania Public Service Commission, in adjusting a complaint brought by the Brownstown Electric Light & Power Company against the Edison Electric Company of Lancaster, said: "Connections with high-power lines should be made only by substations equipped with transformers, switching equipment, lightning arresters and voltage regulators. If made in any other way—especially in the manner desired by the complainant company—the entire territory served by the transmission line of high voltage would be subject to frequent interruptions, since the voltage regulation would not be properly controlled."

Depreciation Charges and Maintenance. — The distribution between charges to depreciation reserve and to current maintenance was discussed by the Arizona Corporation Commission in deducting accrued depreciation in rate proceedings *re* the Tucson Gas, Electric Light & Power Company. "The accumulation of a reserve to meet replacements of property having a life of more than one year has been found expedient," the commission said. "It is clear that a company might charge the cost of replacements of every nature, including trivial repairs, to the depreciation reserve, thereby relieving the expense of maintenance very considerably, or it might charge the cost of all replacements to operating expense as the replacements occurred, thereby eliminating the necessity for any depreciation reserve. Modern accounting, as exemplified by the recommendations made by the N.E.L.A., dictates a middle course in which minor repairs are charged to maintenance and replacements 'incident to important retirements of buildings or large sections of continuous structures, like electric lines, or of definitely identifiable units of plant or equipment,' are charged to depreciation reserve."

Recent Court Decisions

The Indiana Consolidation Case.—The Indiana Supreme Court has set Oct. 4 as the date for hearing argument in the appeal of the Indiana Public Service Commission against the injunction granted to the cities of Indianapolis and Kokomo by the Superior Court which forbade the execution of the order of the commission authorizing the consolidation of seven Indiana electric traction and gas utilities into the Indiana Electric Corporation. The Superior Court, in granting the injunction, declared the action of the commission to be without force and void.

Public Utilities Commission Statute Does Not Deprive Courts of Equity Jurisdiction.—Denying to the plaintiff (State ex rel. City of Cleveland vs. Court of Appeals) a writ of prohibition against the issuance of an interlocutory order by the Court of Appeals, to which the East Ohio Gas Company had carried a rate ordinance passed by the City Council of Cleveland, the Supreme Court of Ohio declared that the act creating the Public Utilities Commission of the state in no way withdrew from the courts any of the jurisdiction in equity which they theretofore had, and that when a case is stated which if true involves confiscation the court will have jurisdiction and issue such orders as may be necessary to preserve the rights of the parties to the controversy (135 N. E. 377).*

Federal Court in Colorado Reverses Itself on Confiscatory Rates.—A decision by the United States District Court in Colorado, in Pueblo Gas & Fuel Company vs. City of Pueblo, reversing a former decision of the same court and following the ruling of the Circuit Court of Appeals in the case of the Denver Tramway Company, permits the plaintiff company to obtain relief despite the existence of a contract previously held by the court to be inescapable in its terms. The finding reads: "The court feels compelled to the belief that the views it has heretofore expressed are erroneous, and that under the ruling in the Tramway case the plaintiff must be granted the relief which it seeks. The writ prayed for should not, however, be without conditions. A rate that is confiscatory today may become highly remunerative within a few years or even months. The order for the writ of injunction may be entered, reserving to the defendant the right to petition that the case be again opened on the facts for the purpose of showing, if it can, that the rates named in the ordinance are no longer confiscatory; and for that purpose the court will retain jurisdiction over the case."

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Men of the Industry

Changes in Personnel
Accomplishments, Responsibilities, Honors, Appointments and Activities of Men Engaged in all Branches of the Electrical Industry

Chubb Elected President of Iowa Section, N. E. L. A.

C. N. Chubb, recently elected president of the Iowa Section of the National Electric Light Association, is the vice-president and general manager of the People's Light Company, Davenport, Iowa. Mr. Chubb was graduated from the Massachusetts Institute of Technology as a civil engineer, and after about two years in steam-railway work he entered the employ of the United Gas Improvement Company of Philadelphia, serving on various properties in positions ranging up to vice-president and general manager. He went from the United Gas Improvement properties to his present work at Davenport. During the past year Mr. Chubb was president of the Iowa District Gas Association, and he is now chairman of the Technical Section of the American Gas Association.

C. N. CHUBB

President McClellan to Make Western Trip

President William McClellan of the American Institute of Electrical Engineers, whose term of office expires next month, when he will be succeeded by Frank B. Jewett, is starting on a Western trip, in the course of which he will meet and address a number of local Institute sections. His itinerary follows:

July 31—St. Paul and Minneapolis. Here he will address the local section at luncheon in St. Paul and at dinner in Minneapolis. Engineers and business men of the Twin Cities will be present.

Aug. 3—Spokane. Luncheon address to engineers and business men.

Aug. 4—Seattle. Luncheon address.

Aug. 5—Portland. Luncheon address. From here he will return to Seattle and be the guest of the local section on a motor trip to the Pacific Coast convention at Vancouver, B. C.

Aug. 8—Vancouver. Presidential address at the convention, his last official function.

Aug. 12—Salt Lake City. Luncheon address.

Aug. 14—Denver. Luncheon address.

Aug. 15—Kansas City. Evening address.

International Tour Planned by Electrical Societies

Kenneth A. McIntyre of the Society for Electrical Development and Lawrence W. Davis of the National Association of Electrical Contractors and Dealers will shortly make a tour through western Canada and the Western States as representatives of their respective societies. The trip has been planned together in order to insure economy of time and effort in covering the twenty-five cities which have been selected for meetings. Mr. Davis will devote his time to advancing the interests of the contractor-dealers by visiting in person every one so far as time permits. Mr. McIntyre will concentrate on co-operative league work.

F. J. Macleod Nominated Justice of Massachusetts Superior Court

Governor Cox recently nominated Frederick J. Macleod, who was formerly chairman of the Massachusetts Public Service Commission, as justice of the Massachusetts Superior Court. Mr. Macleod is well known in the New England public utility field for his able direction of the regulation of transportation and communication companies prior to the consolidation of all regulatory functions in the Department of Public Utilities.

W. L. Frost has been appointed manager of the consumers' department which was recently created in the Southern California Edison Company and will now have general supervision of the activities of that company directly affecting its customers. He will have charge of the personnel and in addition he will supervise the credit and collections departments, the advertising department, the library department and the complaints department. Mr. Frost has been in the employ of the Southern California Edison Company since 1900 and has successively held positions as meter reader, groundman, lineman, bookkeeper, collector, cashier, power salesman, foreman, assistant purchasing agent, manager of three different districts and assistant to vice-president. He has long been active in the work of the N. E. L. A.

General Electric Company Appoints New Manager

Walter S. Goll, who has been the assistant general manager of the Fort Wayne works of the General Electric Company since October, 1918, was selected as manager of the works to fill the vacancy left by the recent resignation of F. S. Hunting. Mr. Goll is fifty years of age and assumes his new executive responsibilities after about twenty-five years of activity in the manufacture of electrical apparatus and machinery. He was born in St. Louis Oct. 30, 1872, and was graduated from Cornell University with the degree of M. E. in 1896. Immediately after his graduation he entered the service of the St. Louis & Suburban Electric Railway Company and in April, 1897, became connected with the railway engineering department of the General Electric Company at Schenectady, N. Y.

About twelve months after this Mr. Goll resigned to become engineering correspondent with the Siemens-Halske Electric Company of Chicago. The Fates, however, decreed otherwise, for this company was subsequently purchased by General Electric interests, and on April 1, 1901, Mr. Goll became manager of the Chicago office of the Fort Wayne Electric Works of the General Electric Company. Early in 1909 the Northern Electrical Manufacturing Company, a subsidiary of the General Electric, was absorbed by the Fort Wayne Electric Works, and Mr. Goll was transferred to Madison, Wis., to become manager of that plant. In 1915 the Madison plant was sold, and in February, 1916, Mr. Goll was sent to Fort Wayne, where he took charge of certain special engineering and commercial work. About two years later Mr. Goll was appointed assistant general manager.

W. S. GOLL

Col. Arthur S. Dwight, president of the American Institute of Mining and Metallurgical Engineers, has been made a Chevalier of the Legion of Honor by the French government. Colonel Dwight served conspicuously with the Eleventh Engineers and received the "D. S. O." from the British government.

Charles F. Rand, treasurer of the American Institute of Mining and Metallurgical Engineers, has been designated for the cross of the Legion of Honor by the French government in recognition of his services during the war. Mr. Rand has been a leader in engineering movements for many years.

W. P. Little a Vice-Chairman Accounting Section, N. E. L. A.

W. Paxton Little was elected a vice-chairman of the Accounting Section of the National Electric Light Association at its recent convention held in Atlantic City. Mr. Little comes to this executive position with the association after many years of relation with public accounting, having been a member of the New York State Society of Certified Public Accountants since 1904 and being chairman of the committee on the classification of accounts of the Canadian Electrical Association at the present time. Mr. Little entered the service of the Cataract Construction Company as auditor in 1893, when this company was engaged in constructing the works of the Niagara Falls (N. Y.) Power Company. At the same time he had charge of the accounts of the Niagara Falls Power Company, and in 1895 he was appointed

W. P. LITTLE

assistant treasurer of that company. In 1905 he was elected treasurer of the Niagara Falls Power Company and the Canadian Niagara Power Company, and he has continued as chief accounting officer of these companies since that date. He was also treasurer of the Tonawanda Power Company from 1905 to 1917. Mr. Little is a member of the American Institute of Accountants and of the National Association of Cost Accountants, as well as the New York State Society of Certified Public Accountants.

Roger B. Stevens, formerly electrical engineer on the consulting board of the American Sugar Refining Company, has opened a consulting engineering office in the Vanderbilt Avenue Building, 51 East Forty-second Street, New York City. Mr. Stevens' office is prepared to do engineering and construction work for all classes of industry, including complete industrial plants, industrial power plants, electrical construction of all kinds, and special investigation work on power, illumination and production problems. In his recently acquired capacity of consulting engineer he has been retained by the A. R. Burnette Corporation and the George Comfort Company of New York City as adviser on electrical and power problems and has retained the A. R. Burnette Corporation as consultants on structural and special industrial work. Mr. Stevens spent a number of years in the contracting business in Michigan and Ohio and was connected with the Montana Power Company of Butte, Mont., on the electrification of the Chicago, Milwaukee & St. Paul Railroad through Montana and Idaho. During the war he was a member of the Signal Corps and Air Service of the United States Army and after leaving the service became associated with the American Sugar Refining Company.

John P. Lucas, the director of public relations for the Southern Public Utilities Company, was temporarily released a short time ago, in order that he might devote his time to a "Live-at-home" campaign then being conducted in North Carolina to bring before the farmers of the state the deplorable results of failure on their part to grow at home the food and feed needed by their families and livestock. Mr. Lucas was so successful in handling the publicity for the campaign that the joint committee for agricultural work passed a resolution thanking him for his efforts.

George McQuaid, well-known Texas newspaper man, has been employed by the public utility organizations of Texas, and is in charge of the Texas Public Service Information Bureau, recently established in Dallas, Tex., with offices at 1004 Magnolia Building. The bureau is issuing a weekly news bulletin giving current news and interesting information regarding the utilities operating in Texas, and about public utilities in general. This bulletin is supplied to the weekly and daily newspapers of Texas and to others interested in utilities. Mr. McQuaid is one of the best-known newspaper men of Texas and Oklahoma, having been connected with various newspapers in those states for the last thirty years, serving in various capacities from reporter to managing editor and editor. Mr. McQuaid was born in Virginia and was educated at Georgetown University.

Dr. Raymond Elected President Armour Institute of Technology

Dr. Howard M. Raymond has been elected president of the Armour Institute of Technology. Dr. Raymond comes to this high position in the field of technical education after twenty-seven continuous years as instructor and professor in the institution of which he is to be the head. He was graduated from the University of Michigan as electrical engineer in 1893 and immediately upon graduation became connected with the Rockford Electrical Manufacturing Company for a period of one year, after which he re-

H. M. RAYMOND

turned to the University of Michigan to take post-graduate work in physics and electrical engineering for two years. In 1895 he was appointed director of the Manual Training School, Ishpeming, Mich., resigning during the same year to accept a position as instructor in physics in the Armour Institute of Technology. In 1898 he was appointed associate professor of physics in that institution, and he filled that post for the following five years, for three of which he acted as principal of the Armour Scientific Academy. In 1903 he was appointed professor of experimental physics in the Armour Institute of Technology and also dean of engineering studies.

E. S. Roberts, formerly sales agent of the Savannah (Ga.) Electric & Power Company, has been transferred to the Blackstone Valley Gas & Electric Company at Pawtucket, R. I., where he is sales manager.

L. H. B. Sandwell, English electrical and mechanical engineer, has come to establish himself permanently in America, after a successful career in India covering exactly twenty years. During his stay in the Orient Mr. Sandwell was connected with the Calcutta Electric Supply Corporation, Barrackpore Electric Supply Company, United Provinces Electric Supply Company and Bombay Electric Supply & Tramways Company.

Manufacturing and Markets

Devoted to the Discussion of Business and Economic Problems of the Producer and Distributor, with Market Reports, Trade Activities, Foreign and Construction News

The True Function of Distribution

What the Jobber Really Is Paid For—The Potentiality of a Territory —What the Manufacturer Should Contribute*

By George P. Baldwin
General Merchandise Manager, General Electric Company

THE day is approaching when electrical merchandise will become a shopping line. But the conditions of the growth of the electrical industry have tended to make us a race of engineers. And this is the reason perhaps why some of us have not realized the importance of the marketing and shopping features of our industry.

We can liken our process of distribution to the voyage of a trading ship that goes to the South Seas in search of the products of the islands there—products which are in demand in the country from which she sails. She purchases goods, gathers them together, makes up a cargo, sails home, and on reaching there sells the goods. The ship has not manufactured anything in the accepted interpretation of the word, nevertheless work has been performed, and the evidence is expressed in expenditures covering the purchase of the goods and the payment of expenses, expenses which in a great many ways parallel those of the present-day jobber.

G. P. BALDWIN

Margin for Work Done

The ship has made for her owners a profit or a loss, not necessarily because they own the ship, but because the ship has made a voyage—a successful or an unsuccessful trading expedition—all depending on whether or not there was a gain or loss. And, incidentally, while the ship could not have sailed without the services of a navigator or a crew, the operation of the ship itself was but one of the contributing factors of the transaction as a whole and a necessary item of expense.

In a word, the ship was but the vehicle by which the goods are transported, and the organization were the buyers, warehousemen and sellers of the goods. The goods were purchased in the South Sea Islands; expense was added, increasing their value by virtue of work that was performed and service that was rendered, and consequently the goods themselves were also vehicles conveying a transaction by which a profit or a loss was made.

We speak of expense in terms of selling price. We speak of percentage of selling expense. We speak of percentage of gross or net profit in terms of volume of sales. Some day we are going to speak more of the ratio of gross profit and expense, and after we get that idea firmly fixed in our minds we are going to change somewhat our attitude and some of our methods. For, after all, the important point is that the jobber receives a certain margin for work to be performed for the benefit of the community which he serves—a margin regulated to a large extent by competition—and it is what he saves by his superior methods, as against those of others likewise engaged, that is his net profit.

We must learn more of the potentiality of a given territory also—what is the total demand of a given territory and what is a fair share. To get this information we must know very thoroughly what we are selling, where and to whom; and if the study of potential demand did nothing else, it would at least make us learn more of our customers—what and from whom they are buying.

With these facts as a start, then we can begin the study of logical territory. To what radius can a jobber in a given geographical center of distribution afford to go, beyond which he cannot serve with profit to himself or the community? For any concern can only handle volume to the limit of its capital and within a radius that will net a fair return. Or, as our economist friend might say, What are the possibilities before the law of diminishing returns begins to indicate that an operation from a given center is not truly in the public interest? This may seem academic, but it has been very forcibly brought to the attention of our mail-order houses.

The Share of Each

A jobber may say that he is doing a nice business in a certain territory. But the jobber alone cannot be the sole judge. This is a feature in which the manufacturer and consumer both have a deep interest. The measure of the jobber's effectiveness must be his realization of the available potential demand. I think it is modern to consider the transaction closed only when the goods are in the hands of the ultimate consumer and satisfactorily performing the service for which they are intended and when all concerned—manufacturer, wholesaler and retailer—have contributed their full, fair share and each has received his just compensation.

When the manufacturer, the jobber, and the retailer for that matter, each participates in the whole operation as a unit, and each contributes his full, fair share, and each fairly considers the problem as a whole and all work together in sequence

*Part of an address recently presented before the General Electric Distributing Jobbers' Association.

and harmony as a team, then goods are bound to flow smoothly and evenly from the gathering and fabricating of the raw material through to the ultimate consumer. Our ship will have made a successful voyage, each contributor will have received his just compensation, the public interest will have been economically served and the service fairly rewarded. If we work on any other basis, we are liable to be "opportunists" rather than intelligent American business men.

CUSTOMER BENEFIT SUCCEEDS

This may seem to be an ideal condition, but it seems to me if we are going to progress in the future, we must approach the problem in some such manner. If we are all thinking along these lines, all thinking of others concerned as well as ourselves, we are bound to produce sound ideas and establish advanced practice; and not only will we profit, but the consumer will as well. No scheme of distribution or of manufacture or combination of both can, in my judgment, go ahead and disregard the consumer. It is the history of all successful merchants and manufacturers engaged in commodity lines that they have succeeded best on the basis of lowering costs, sharing the savings with the consumer, and necessarily they have increased their own profits by so doing. Any plan that is evolved whereby the manufacturer has all the profit or the jobber has all the profit will not be satisfactory, but if both have a satisfactory profit, then the arrangement will be sound and we can enjoy happiness and prosperity.

You may say this has been tried for years. Perhaps it has. I have my doubts. If it has, then the trouble has been in our approach. We have said this was wrong, that was wrong, or the other thing was wrong; we have not said this was right, that was right, or the other thing was right. Let us see if we cannot get together on a platform of rights rather than wrongs—then we shall surely have a secure foundation. The future will be built on rights rather than wrongs.

TRUE CO-ORDINATION

I would say that the problem of the manufacturers is:

First, to have our factories make goods in a class by themselves as to quality, at a price commensurate with this quality.

Second, to establish a contributing commercial service that will respond quickly to the demands placed upon it.

Third, to have every one in the field and in the factory appreciate the distributor's and consumer's viewpoint as well as our own, so that we may approach the problems with sympathy.

Fourth, to make a thorough survey of demand with a view toward determining territorial potentiality and limitations and to have this information available so that the best use can be made of it, to assist the distributor, if he requires it, in obtaining his full share of the potential.

Fifth, to create by personal contact on the one hand and advertising and publicity on the other, a popular demand, and to do this on the basis of inviting the attention of the consuming public to the fact that the manufacturers' names on the goods is evidence of quality and the distributor's name is evidence that the service and the accommodation is all that it should be. Then the entire transaction has back of it the guarantee of quality and excellence of service.

Solving the Radio Distribution Puzzle

Some of the Effects of Random Distribution—The Trend Toward Electrical Trade and Specialty Shops

BY E. PADELFORD COCHRANE

AS IT is conservatively estimated that the American people will have spent in 1922 between $30,000,000 and $50,000,000 on radio equipment, and as the distribution situation in radio is a stew of uncertainty and experimentation, it is easy to see that for the business man the "romance" in radio lies not in the magic ether waves, but in the adventure of solving the distribution puzzle. Radio is a youngster that has grown too fast. Consequently it has outgrown all existing radio facilities almost before it has started.

With businesss dull in other lines there came a stampede of dealers from half a dozen lines to "cash in" on the one buying hobby in which the public seemed still keen.

In less than six months time the radio industry raced along the merchandising highway from a starting point of a small, rather unnoticed accessory in a limited number of electrical supply stores to a multiplex distribution machinery including radio jobbers, radio specialty stores, cut-price stores, mail-order supply houses, radio chain stores, radio co-operative buying associations, radio chambers of commerce, general and dealer publications, directories and at least 25,000 distributive outlets which included everything from 5 and 10 cent stores to handsome, specially built-in departments in department stores with clerks trained in radio technique. For an Aladdin's lamp marvel the distributive situation in radio rivals in a measure the marvel of the audion tube itself.

As it stands at present, the highly technical nature of radio, and the general public lack of knowledge concerning it, makes the service factor extremely important, especially in the higher priced makes. Therefore, the most decided tendency is toward making either the radio specialty shop or the electrical goods dealer the medium for distribution. Hardware stores, drug stores and department stores as a class are not well equipped to supply service, nor are they, as a rule, anxious to do so.

Ultimately, it is the consensus of opinon that the ideal distributor of radio apparatus will be the radio specialty shop, where full stocks of all types of radio goods will be carried and studied; where exact knowledge, professional responsibility and care can be provided, as well as adequate service.

Unless newer inventions, doing away with certain troublesome technical features, appear on the market, service will increase rather than decrease in importance, and the radio specialty shop will be more and more necessary. If service becomes of less importance through radio progress in simplification, it is possible that the business will continue in the hands of other types of distributors.

The eventual number and types of retailers will be largely determined by the complexity or simplicity of the more expensive sets. The history of analogous products indicates that cheap sets are used for experimental purposes mainly, and that as soon as the consumer masters the technical intricacies, he buys a more expensive machine, whereby he can get much more satisfactory results.

For this reason, the merchandising of the larger sets, together with the necessary service, are bound to be increasingly important factors in the trade. At this time, the distribution of such sets is getting largely into the hands of the electrical dealers, where it is most easily handled, and department stores and miscellaneous retailers are confining themselves principally to selling the smaller sets, which are more easily sold and on which less service is expected.

The jobbing situation also may undergo changes before long. Radio is sold both through jobbers and direct to retailers, although as in most other lines of a complicated technical nature, it is regarded as more satisfactory to sell direct.

The large number of cheap sets sold—a ratio of about five to one—also has its influence on the division of trade between jobber and dealer, as the cheap set, being in large demand and requiring little technical demonstration, is an article easily handled by jobbers. The estimated 5,000 jobbers' salesmen handling this type of goods unquestionably constitute an efficient and excellent medium for wide distribution at minimum cost, particularly when demand is in excess of supply.

Strikes Cause Conduit Price Advance

Another increase in the price of conduit is reported by manufacturers. This is a decrease of three points in the discount list or an advance of about 6 per cent. Most manufacturers issued the new price card on July 24. The preceding advance was on July 6, when a 4 per cent increase went into effect. The coal and railroad strikes are directly responsible for this advance. Stocks are low in New York City, and curtailments at Pittsburgh mills make the general situation more serious, manufacturers point out.

New Business Barometer to Be Inaugurated

A new barometer of business, which is expected to touch the industrial pulse of the nation, is to be inaugurated next month by the Post Office Department, it is announced by Third Assistant Postmaster-General Glover. Since 1900 the department has issued monthly comparative figures on postal receipts for the fifty largest cities in the country. Mr. Glover is compiling a second list of fifty cities which are to be essentially industrial cities. Postal receipts, always considered a significant indication of the trend of business, are being watched more closely now than ever before for the expected clue to the prospective business boom and the recovery from the recent depression.

Two Electric Locomotives Exported in May

Only two electric locomotives were exported from the United States during the month of May, a recent report by the Bureau of Foreign and Domestic Commerce states. These were sent to Chile and were valued at $10,900.

Platinum Market Continues Steady

Demand for platinum continues steady with only small quantities of the crude and manufactured metal entering the port of New York. Recent advices from Colombia are that floods on the Condoto and upper Atrato rivers have receded and larger shipments can be expected within the next month. It is noted that "contact point" manufacturers have placed orders to replenish depleted stocks. Prices remain unchanged in the market.

Fewer Freight Cars Reported Idle

Freight cars idle on American railroads because of business conditions totaled 405,185 on July 1, compared with 429,074 on June 23, or a reduction of 23,889 cars, according to reports just received from the railroads of the United States by the American Railway Association.

Loading of revenue freight totals 718,319 cars during the week which ended on July 8, compared with 876,-896 cars during the preceding week, or a reduction of 158,577 cars, according to reports just filed by the same association. This reduction under the previous week was due to the observance of Fourth of July as a holiday throughout the country. Despite the coal strike, however, there was an increase of 77,784 cars over the corresponding week last year, but a decrease of 77,872 cars compared with the corresponding week in 1920.

Further Gain in Building Permits Reported

The spring and summer months this year as was expected, have been marked by noteworthy expansion in the value of building permits issued throughout the country. Complete statistics for July, of course, are not yet available, but the June exhibit discloses an even heavier total than was recorded in May. At more than $224,000,000, permits granted at 104 cities last month represent a rise of 8.7 per cent over those of May, when the number of centers reporting was 102, and are 64.8 per cent in excess of the amount involved at 104 cities in June, 1921. Outside of New York City, with gains largely predominating, the June permits surpass those of that month of last year by 81.2 per cent, while there is an increase at the metropolis of 21.1 per cent. With an average of 104 cities making monthly returns, permits issued from January 1 last to the end of June had an estimated value of fully $1,081,700,000, or about 72 per cent more than the aggregate for the same six months of 1921.

Says 610,000 Miners Are Out, 185,000 Are at Work

Approximately 610,000 coal miners are on strike in bituminous and anthracite coal fields and 185,000 are at work, the Department of Labor announces upon completion of a survey of the coal mining industry.

The effect of the strike as revealed by the survey is set forth by the department in a table which by states gives the approximate number of men employed in the mines when the general suspension of work was declared and the number now on strike as follows:

States	Employed Before Strike	On Strike
Alabama	30,000	None
Arkansas	5,000	4,000
Colorado	15,000	4,000
Illinois	90,000	90,000
Indiana	30,000	30,000
Iowa	15,000	15,000
Kansas	13,000	12,000
Kentucky	40,000	5,000
Maryland	7,000	5,000
Michigan	3,000	3,000
Missouri	12,000	11,000
Montana	5,000	5,000
New Mexico	4,500	1,900
Ohio	50,000	50,000
Oklahoma	10,000	9,000
Pennsylvania (bitum.)	175,000	155,000
Pennsylvania (anthracite)	155,000	155,000
Texas	4,500	4,000
Utah	4,000	2,000
Virginia	12,000	None
Washington	5,000	2,000
West Virginia	90,000	40,000
Wyoming	8,000	7,000
Total	895,000	6 0,000

Now at work, 185,000

Non-Metallic Tubing Marking Specifications Issued

The Underwriters' Laboratories of the National Board of Fire Underwriters, Chicago, have issued a new page relative to the marketing of flexible non-metallic tubing, as follows:

"The product designed to meet the foregoing specifications must have a distinctive marker for its entire length so that it may be readily identified as to actual manufacturer.

"Flexible tubing which does not contain a distinctive registered marker for its entire length will not be accepted as standard.

"Each coil of flexible tubing must be plainly tagged or marked, as follows: Name of manufacturing company, or, if desired, trade name of the tubing. The manufacturer's listed marker for the product. This marking may be placed on the outside of individual cartons, instead of on tags, when such cartons are employed to ship coils of tubing.

"Observations will be made with regard to tags attached to coils of the product to note that both of the items enumerated in paragraph 282 are properly given on the tags or cartons."

Smaller Sizes of Magnet Wire Scarce

Deliveries are uncertain, according to Boston jobbers, upon magnet wire of the finer sizes, definite shipment promises being difficult to secure on Nos. 38 and 40. Lower down in the scale conditions are much easier, and in the twenties deliveries out of stock are quite general. The demand is largely from manufacturers of radio apparatus. Prices are reasonably steady at present. In 100-lb. lots No. 18 silk-enameled wire is moving at $51.98 per 100 lb. As the size decreases the cost of the silk insulation grows by leaps.

England Will Bar Foreign Radio Sets for Two Years

Foreign radio receiving sets will be barred under the British broadcasting scheme, Postmaster-General F. G. Kellaway of England has announced in answering questions in the House of Commons. He has informed British manufacturers that, in the event of their providing efficient broadcasting apparatus, permission under post office license will be restricted for two years to sets manufactured in Great Britain.

This concession, it is stated, is due to the representations of British firms that they will have to use capital in creating a demand for radio sets and that they cannot employ it if they have to meet the competition of American and French sets, of which some thousands have been sold.

Bank Clearings Continue to Show Substantial Gains

Substantial gains in bank clearings over last year's totals continue, an aggregate of $6,771,075,749 at twenty cities in the United States this week as reported to *Dun's Review*, representing an increase of 18.8 per cent over the $5,696,065,882 of a year ago. Decreases still appear, however, in comparison with the clearings of 1920, the reduction from the $7,614,659,959 of the corresponding week of that year being 11.1 per cent. Aside from Kansas City and Minneapolis, where losses of 5.5 per cent are disclosed in each instance, this week's clearings exceeded those of last year at all centers reporting, and the $2,450,675,749 at the outside cities which is included in the statement marks an expansion of 13.9 per cent over the total of a year ago. At New York City, which reports clearings of $4,320,400,000 this week, there is a gain of 21.9 per cent.

Labor Shortage Affects Copper Production

Production of copper has been affected more by labor shortages than by either the coal or the rail strike, according to New York City representatives of Western and Michigan Mines.

The higher wages and steadier employment offered by Montana oil companies and Detroit automobile manufacturers have attracted both unskilled and skilled workers in those regions from the mines. Some of the Western companies have not only paid transportation of families back to copper regions but have assured skilled workers that they will be retained for repair and improvement work around mines when a slump occurs. The labor shortage prevented overproduction of copper threatened in May and has, therefore, aided in maintaining present prices of the metal.

Short Asbestos Fiber Demand Is Improved

Decided improvement in the demand and consumption of the shorter grade of asbestos fiber is noted, says a recent report from the Asbestos & Mineral Corporation, New York City. "While the demand for longer grade of asbestos fiber is not quite so brisk, there is a perceptible improvement. All of the Canadian mines, with but a few exceptions, have resumed or are about to resume operations, and prospects for the asbestos industry are much brighter for the last half of the current year. We venture to predict that by the end of the year the depression cloud in this industry will disappear entirely. We believe that the recent downward revision of prices has about reached the lowest point commensurate with present costs of labor and supplies."

Metal Market Situation

Buying of copper is in small volume both here and abroad. Domestic producers are unwilling to make further commitments until the situation clears. The impression of one producer who has been feeling out the market is that large buying is to be expected as soon as the strike situation clears. In the meantime the market will be very quiet, he says.

Most producers are unwilling to sell under 14 cents, delivered. The demand aside ship is meager, in sympathy with the slow European demand. France and Germany are the only countries buying directly from producers, as England is temporarily out of the market.

Figures for the fiscal year ended June 30 show that approximately $90,000,000 has been realized in sales of copper to foreign consumers. The Copper Export Association handled the bulk of this metal.

NEW YORK METAL MARKET PRICES

Copper	July 20, 1922	July 27, 1922
London, standard spot	£ s. d. 63 2 6	£ s. d. 63 2 6
	Cents per Pound	Cents per Pound
Prime Lake	14.00	14.00
Electrolytic	14.00	13.87½
Casting	13.35	13.35
Lead, Am. S. & R. price	5.55	5.75
Antimony	5.05	5.25
Nickel, ingot	36.00	36.00
Zinc, spot	5.50	6.25
Tin, Straits	31.62½	32.25
Aluminum, 98 to 99 per cent	19.10	19.10
OLD METALS		
Heavy copper and wire	10.50–11.00	10.50–11.00
Brass, heavy	5.50– 5.75	5.50– 6.00
Brass, light	5.00– 5.12½	5.00– 5.12
Lead, heavy	4.62½–4.65	4.62½–4.65
Zinc, old scrap	2.87½–3.12½	2.87½–3.00

The Week in Trade

Prices When Quoted Are Those Reported at the Opening of Business on Monday of This Week for Points West of the Mississippi River and on Tuesday for All Eastern Points

STRIKES hindering movement of electrical apparatus are causing lower stocks and advanced prices. Prices are strong, the feature of this week's market being a decrease of three points in the list of conduit by manufacturers. This means an increase of approximately 6 per cent in quotations. Wire sales are in good volume. Pole-line hardware in the Chicago district has advanced 5 per cent. Keen competition prevails and stocks are moving steadily.

New York

Conduit Advances Again — Rubber Covered Wire Prices Unchanged— Better Grade Fixtures Active

Demand for all kinds of electrical materials remains steady, and prices are reported stronger. The feature of this week's market is the advance of approximately 6 per cent in the price of conduit. This is the second advance in the month of July. Flexible armored conductor continues in active demand and plentiful stocks are reported. Cleaners and washers are gaining more attention than for some months past. Jobbers report that their sales to industrial and manufacturing plants are steadily increasing.

Rubber-Covered Wire.—Prices remain unchanged. Demand is fair, and jobbers are inclined to hold their stocks in expectation of a better market.

Outlet Boxes.—Demand for outlet boxes continues strong following the recent price advances. Stocks are noted to be ample.

Lighting Fixtures.—These are selling well; the better grades seem to be in greatest demand.

Fans.—Demand for fans continues to fall off. Jobbers are of the opinion that the market is quite thoroughly sold.

Chicago

Depleted Conduit Stocks—Pole-Line Hardware Advances 5 Per Cent— Loom Reported Sluggish

Movement of electrical supplies has been satisfactory this week, although prices on conduit and rubber-covered wire are stronger. The building activities are increasing the call for all items used in wiring. Slow deliveries from conduit manufacturers are not assisting the forward stride of the electrical jobbers. Plans for manufacturing expansion, necessitated because of the volume of high-tension business, were reported by one company during the week. Pole-line hardware has been increased 5 per cent and competition is keen.

Conduit.—An active demand with slow deliveries from manufacturers is causing a scarcity of the ½-in. conduit. The other sizes are available. Prices vary from $45 to $47 per 1,000 ft.

Wire.—House wiring is holding a consistant demand for wire and the market has strengthened slightly. Stocks are ample. Few changes were noted on the call for bare or weatherproof wire, but prices are firm.

Flexible Armored Conductor.—This material is moving at a quiet but steady rate. In lots of 5,000-ft. the No. 14 two-wire, single-strip, sells for $42.50 per 1,000 ft. Dealers' stocks are normal.

Pole-Line Hardware.—An advance of 5 per cent went into effect the middle of this month. Dealers state that competition is keen and that they are moving their stocks steadily.

Loom.—Demand for loom is spotted, but in general the call has been sluggish.

Boston

Railroad Buying 25 Per Cent Better— Building Operations Gain— Wire Sales Good

Active business continues despite the railroad and coal strikes. Railroad buying from jobbers is about 25 per cent better than a year ago. Building operations are gaining, New England contracts totaling $5,949,300 for the latest week reported. Deliveries are still good in most lines, but some uncertainty as to rigid-conduit shipments is reported. Labor conditions in the textile field are improving.

Fixtures.—Stocks are being built up in anticipation of active local demand in the late summer and fall. Mercantile and residential sales predominate and inquiries are very vigorous.

Wire.—Sales are in good volume, especially for interior uses. Rubber-covered No. 14 sells at $6.25 per 1,000 ft. in 5,000-ft. lots, and weatherproof is moving moderately well on a 16-cent base. Little bare is changing hands. Deliveries are long on the smaller sizes of silk-covered magnet wire.

Flexible Armored Conductor.—This material continues to display strength in sales, with ample stocks and firm prices. No. 14 single-strip moved on Monday at $43.20 per 1,000 ft. in 1,000-ft. lots.

Rigid Conduit.—Prices on ½-in. pipe have been announced as follows on less than 500 lb. and on 500 lb. to 5,000 lb.: $64.19 and $58.35, galvanized, per 1,000 ft. Elbows are quoted at $13.09 and $11.90 per 100, and couplings, $6.14 and $5.58 per 100. Corresponding prices for black conduit are $58.58 and $53.25; elbows, $11.84 and $10.75; couplings, $5.68 and $5.16. Deliveries are causing some uneasiness, though immediate necessities are being well cared for.

Atlanta

Better Radio Business—Financial Conditions Improved—Safety Switches Continue Active

Electrical interests report that business has shown improvement, especially in the lines of radio equipment, fans and seasonal specialties, while they are in receipt of many inquiries from large industrial interests which will undertake expansions as soon as conditions become more stable. Bankers report financial conditions throughout the state as better than for many months past, with money easier and in plentiful demand.

Lighting Fixtures.—Both commercial and residential types are in very satisfactory demand, the medium-priced residential type being the most popular. Agitation by central stations for better industrial lighting will doubtless tend to stimulate the movement in this line. Stocks and shipments are good.

Distributing Transformers. — The volume of sales in this line is reported as only fair. The large number of transformers thrown on the market by the salvage from army camps is holding down the sales of new apparatus. Stocks are in good condition, but shipments are reported from good to slow.

Wire.—This line is very active in both weatherproof and rubber-covered, the brisker movement being in the popular sizes, though there is considerable sale of and inquiry for the heavy cable.

Fans.—The season on fans finally opened with a rush, and sales have been most satisfactory. As a result stocks have reached a low ebb, with shipments from factory slow and inadequate. Should the hot weather continue—and the prospects are that it will—it appears there will be a shortage in certain lines. No recent price changes are reported.

Vacuum Cleaners. — Advertising coupled with vigorous sales efforts are bringing in only a fair volume of business in this line. Jobbers' stocks are good and shipments satisfactory.

Safety Switches.—This line continues as active as usual with the demand showing a satisfactory and steady increase. Jobbers' stocks in the popular sizes are in fair shape with shipments satisfactory.

Bell-Ringing Transformers. — This item is increasing in popularity, but sales have not come up to the volume that was anticipated, though it is very probable that they will go stronger in the latter part of the summer as homes near completion. Jobbers' and dealers' stocks are in good condition.

San Francisco

Railroad Strike Conditions Easier—Insulating Material Stocks Well Assorted

Railroad strike conditions are easier and fruit shipments are again moving. The threat of an Eastern tie-up has prevented much use of the 10 per cent lower rail freight rates effective July 1. Building contractors are very busy, but dealers report stagnant summer business. Non-employment is limited to strikers and drifters.

Firms selling marine materials and specializing in wiring and fittings for ships report a quiet market. Their business has greatly declined since the war and will continue dull if the present bitter rate war between companies, operating coast to coast lines, results in forcing several of them out of business.

Insulating Material. — Local stocks are good and well assorted. Demand is better than for a year past.

Pole-Line Hardware.—This line has been in excellent demand this year. All the power companies are building rapidly and much fututre business is in sight. Several jobbers maintain complete stocks and the increasing competition has produced special prices.

Schedule Material. — Bigger shipments than ever before are made regularly to the Coast.

Household Appliances.—Washers, despite the vacation season, are showing better sales than earlier in the year. The number of makes marketed has noticeably decreased. Vacuum-cleaner sales have rather sharply dropped. Sewing-machine sales have largely passed out of the hands of electrical dealers, and for a time at least the old door-to-door methods of sewing-machine dealers are again getting the bulk of the business.

St. Louis

Increased Demand from Industrials Reported—Transformer Business Active—Used Motors Sought

Notwithstanding seasonal slackening in certain lines, increased demand from industrials and from construction is resulting in increased business each week. Some jobbers report business from 100 per cent to 150 per cent better than at this time last year. Appliances, especially flatirons, fans, washing machines and vacuum cleaners, are contributing to the increased business. The power companies are closing more and larger power contracts, and the power companies in and around Kansas City are reported to be expanding at an exceptionally rapid rate. Recent price changes have tended to unsettle the market, but stocks on the average are so low that very little undue competition is experienced.

Farm-Lighting Plants. — Improved agricultural conditions this year and lower prices are resulting in numerous inquiries, and the indications are that fall will see a good business in this line. At present the demand is comparatively dull.

Protective Equipment.—One jobber reports the sale of lightning arresters for use on distribution circuits better than in 1920. Demand is occasioned by new distribution and transmission extensions and by the increasing desire of the power companies to protect their equipment.

Transformers.—The demand is especially good for single-phase units for lighting purposes, and both single-phase and three-phase power units are showing improvement. More activity is found in high-voltage transformers than at any time since 1920.

Portable Drills. — Industrial plants and garages are buying more liberally, but the demand continues comparatively dull.

Meters.—Little change in demand is found in eastern Missouri and southern Illinois, though sales are in satisfactory volume. In western Missouri and Kansas exceptionally active conditions are reported.

Motors.—Used motors are being more generally sought, but their supply is limited, especially as the purchaser usually wants quick delivery. Plans are being announced for the construction of new industrial plants, and as a consequence motor business is expected to strengthen materially in the near future.

Portland–Seattle

Good Business in All Lines—Appliances Moving Slowly—Ranges in Greater Demand

The unusually long dry spell, which has lasted for more than two months and a half, continues to be a serious menace to the forests of the Northwest. Fires which rain alone can stop are daily destroying much valuable timber. Wheat and other grain crops will be greatly reduced. The port business of both Portland and Seattle has been very good so far this year. Building throughout the Northwest continues very active.

Electrical jobbers report business good in almost all lines. Jobbers, however, are becoming somewhat alarmed over the rail strike situation and fear a shortage of material. Some delay is now being experienced in getting shipments from the East. Reduction of transcontinental freight rates will not affect prices to any great extent.

Contractor-dealers are busy with contracting work, but store sales are somewhat below normal. Appliances, with the exception of ranges, are moving very slowly. Ranges are in greater demand than ever before in the history of the business in this section. All of the better class of apartment houses which are being built are installing electric ranges. Dealers who have been handling radio equipment report that this line is now very dull.

Activities of the Trade

Devoted to News of the
Manufacturer, Jobber, Agent, Contractor and Dealer, Including Important Orders and Contracts for Apparatus and Equipment

Fireside Radio Set Moves to Permanent Location

The Fireside Radio Set Company has moved to its permanent location at 6332 Cottage Grove Avenue, Chicago. This company, which has been capitalized at $25,000 for the purpose of dealing with wholesale and limited retail business in radio equipment, was located for organization purposes at 6459 South Green Street, Chicago. A. C. Spencer is president and B. H. Ehringer is vice-president.

Organized for Radio Research and Wholesale Distribution

The General Radio Laboratories, Inc., 1730 Tribune Building, Chicago, has been organized for research and wholesale distribution of radio equipment with a capitalization of 250 shares of no par value.

R. L. Steffey, vice-president, declared to a representative of the *Electrical World* that the main purpose of the company was to serve as a distributor of high-grade radio apparatus ranging from complete sets to spare parts.

The officers of the company are R. H. O'Connor, president and treasurer; R. L. Steffey, vice-president, and F. G. Steffey, secretary. The establishment of its laboratories is being planned, although no definite details are available at present.

Study Sales System for Crediting Business from Appliances

The Charles H. Tenney Company of Boston, public utility engineer, has appointed a research committee to investigate and make recommendations relative to a point or credit system to be used in connection with crediting its various companies' sales department with the sale of appliances which consume a large amount of gas or electricity.

It is pointed out by this company that the sale of electric flat irons is highly desirable from a central company standpoint, owing to the amount of electricity consumed. However, the cost attached to merchandising this appliance in quantities is so great that the sales department oftentimes cannot show even a slight profit at the end of a campaign.

"But with a point or credit system,"

the announcement states, "the sales department would be credited with so many points per electric iron, each point having a monetary value.

"At a stipulated period these points would be totaled, and an equivalent sum derived from general expense or such other source as might be determined would be credited to the sales department."

Electrical Engineering Company Moves to Larger Quarters

The Electrical Engineering Company is now established at 2014 Wabansia Avenue, Chicago, having moved from 922 East Forty-first Street. This removal has increased its manufacturing floor space 200 per cent. An active transformer business created the demand for larger facilities. There were no changes in personnel with this expansion.

Form Consulting Engineering Service in Chicago

C. H. Shepherd and S. S. Hovey have formed the firm of Shepherd & Hovey, consulting engineers, 53 West Jackson Boulevard, Chicago. This firm has established an electrical quantity service consisting of the preparation of electrical estimates showing required materials, the production of drawings, etc., with the actual costs to be added by the client. The service is designed to be of assistance to electrical engineers and contractors.

Indiana Service Corporation Is Making Improvements and Additions

Improvements and additions costing $250,000 are being made by the Indiana Service Corporation on the company's power plant in Fort Wayne.

A new switch house is to be built. This unit, which will cost $10,000, will be an auxiliary to the main plant and an addition to the present building housing the distribution system. The first unit of the new building was begun last November. It will be finished, together with a second unit, by the middle of August. Work on the second unit was started recently. The company is doing the construction work itself.

The improvement made by this new building will permit a better distribution of power. It will tend to eliminate interruptions to service, assuring a more uniform flow of current. Current, as the result of this new arrangement, will be furnished more uniformly and with less chance of temporary cessation for lighting, for street and interurban systems and for industrial plants.

Another change of importance is the addition to the company's equipment of a new turbine which, it is said, will be larger than either of the two now in use. This change has necessitated the installation of new machinery at the various substations of the corporation and this work is now in progress.

To Develop Standard of Public Utility Advertising

Michigan public utilities have been invited to align their advertising managers with a national advertising association for developing standards of advertising copy and ideas for telling the public utility story.

The movement, which is only just under way, was recently inaugurated at Milwaukee. It is planned to form the Public Utility Advertising Association and to make it a unit of the Associated Advertising Clubs of the World. A code of standards has been suggested which contains the following points to be observed in the preparation of copy.

First consideration must be given to the public interest; no erroneous or ambiguous or misleading claims shall be made; every consistent effort is to be put forth to sustain public confidence in statements contained in advertising copy; no unfair demands must be made upon those who sell advertising copy, and co-operation must be extended to publishers in the interest of keeping their columns free from erroneous and false matter.

To Hold Second Radio Exposition Jan. 13 to 20, 1923

The second National Radio Exposition will be held in Chicago, Jan. 13 to 20, 1923, according to a recent announcement made by Milo E. Westbrooke, manager of the exposition, and president of the International Trade Exposition Company, Chicago. The announcement says:

"In our plans of advertising the exposition and our exhibitors nationally we are preparing a directory telling where to buy radio sets, parts and supplies, the same to be mailed to a list of nearly 20,000 radio dealers throughout the United States. Each of our exhibitors will be given a half page 'ad' in this directory without charge."

Cable Company's St. Louis Plant Nearly Complete

The Standard Underground Cable Company, St. Louis, Mo., expects to have its new plant in operation within a few weeks. Under the original plans it would have been opened last spring, but labor troubles, which involved the builders alone, occasioned delay.

The factory buildings are virtually completed. There are three of these, in the form of wings westward from a single front that extends 320 ft. along Kings Highway, each 560 ft. long. The site embraces 15 acres. These wings are to be filled with machines, installation of which is the main work yet to be done. Some of these already are on the floor, others are arriving in large numbers daily.

The local plant production is to supply the trade in the South, Southwest and Middle West as far as Denver, which calls for heavy output. Other plants of the company are at Pittsburgh, which is headquarters; Perth Amboy, N. J.; Oakland, Cal., and Hamilton, Ont. E. J. Pietzcker is manager of the sales offices in St. Louis and Chicago.

International Trade Body to Sail Aug. 19

An international trade commission, directed by the Southern Commercial Congress, will sail from New York on the "George Washington" Aug. 19 for a tour of the principal cities of Europe. It is reported that more than ten electrical manufacturers will be in the commission. The object of the commission is to investigate the possibilities of the development of trade in Europe. The commission will be the fifth foreign mission that the Southern Commercial Congress has sent in the last fourteen years, including trade commissions to Europe, South America and the Orient. The commission will have the indorsement of the United States government.

Although the commissioners will be limited in number, being appointed by governors of the various states, by mayors of the larger cities and by a few of the great commercial organizations, the congress has arranged to let a few New York business men who desire to investigate trade conditions in Europe accompany the commission unofficially.

"Home Beautiful" Exposition to Be Held in Philadelphia, Oct. 9

A "home beautiful" exposition will be held in Philadelphia at the Commercial Museum Oct. 9 to 14 inclusive, officials in charge have announced. The announcement says:

"Every labor-saving and pleasure-giving device that is of interest in the modern home, as well as every furnishing that adds to its artistic and esthetic betterment, will be seen at the coming show," according to its officials. "More than a million complimentary tickets will be distributed to the housewives of Philadelphia and vicinity, and practically the entire space on the spacious exposition floor has been contracted for by leading dealers in household appliances.

"In keeping with the artistic quality of the show, the booth arrangements and general scheme of decoration will represent the utmost in beauty and fitness.

"The established place of musical instruments as an integral part of every home today will offer a wide scope for dealers in player pianos, talking machines and other instruments.

"The almost indispensable place that electricity and electrical appliances have in the home, covering practically every field of household activity, will offer opportunities for the most interesting displays by electrical dealers. Every convenience and pleasure-giving device that the mind can conceive will be on exhibition. It is proposed with the assistance of the Electric Club of Philadelphia to show a complete model

home, thoroughly equipped with everything that makes the home delightful through the medium of electricity and proper wiring. Cooking and house-cleaning devices, machines for electric sewing and appliances for personal use will be among the exhibits.

"The importance of a warm, cozy house, with its appeal to menfolk who have to arise at an early hour, will be shown in improved weather stripping and in the latest stove and furnace appliances, such as that which automatically shuts the top door and opens the draft just before the rising hour.

"Everything imaginable in sewing machines, washing machines, vacuum cleaners and other appurtenances for laundering and house-cleaning will be on hand. The Philadelphia Laundry Owners' Exchange, which is an exhibitor, will during the week invite visitors to the show."

Menominee & Marinette Company Purchased by Wisconsin Interests

Purchase of the property of the Menominee & Marinette Light & Traction Company by the Wisconsin Securities Company was consummated and possession of the property was taken on July 1, 1922. The company serves the cities of Marinette, Wis., and Menominee, Mich., with electricity for light and power and also supplies the gas and street railway service. The electric distribution lines of the company likewise serve the towns of Stephenson and Wallace in Michigan.

The transmission lines of this company will be connected with those of the Wisconsin Public Service Company by a new line approximately 20 miles long, and it is hoped that this connection can be completed this fall.

Extensive repairs and additions to the company's gas plants and distribution mains, as well as to its hydraulic station and transmission facilities, are under consideration. The major portion of the planned improvements can be completed for service within the present year, it is said.

Northern States Power Company Visited by 4,000 People

More than 4,000 people visited the new offices and appliance display room of the Northern States Power Company at Sioux Falls, S. D., when the formal reception for customers was held July 7 and 8. The "open house" was arranged to give citizens of the city a chance to visit the new quarters, which were built especially for the company, and to view the large showing of the newest electrical appliances.

Specialists in demonstrating the various electrical appliances were brought in from the company's headquarters at Minneapolis, and several manufacturers' representatives also assisted. Labor-saving appliances attracting the most interest were the electric range, washing machine, vacuum sweeper and automatic electric refrigerator.

Visitors were asked to register their names and addresses, and on both days of the reception drawings were made and prizes were awarded to the lucky participants. An electric washer, vacuum cleaner, flatiron, toaster and curling iron were among the prizes given away.

Standard Gas & Electric Company Announces Sale of Shares

Customer-ownership sales of preferred shares at the operated public utility properties of the Standard Gas & Electric Company for the first six months of 1922 resulted in 8,400 transactions, having a total par value of $4,813,250, that company announces. This is an increase of 23.2 per cent over the corresponding period of 1921, when there were 7,500 sales, with a par value of $3,906,200. Sales for the calendar year 1921 amounted to $8,001,000, and the present rate of increase applied to that figure will bring the total for 1922 close to $10,000,000. The companies which are placing their securities as investments among their customers are the Louisville Gas & Electric Company, Mountain States Power Company, Northern States Power Company, Oklahoma Gas & Electric Company, San Diego Consolidated Gas & Electric Company, Southern Colorado Power Company and Western States Gas & Electric Company.

Another Chicago Jobber Is Selling Directly by Mail

The Electrical Merchandising Corporation, 106 South Jefferson Street, Chicago, is one of the latest electrical supply jobbers to enter the field of selling direct by mail. A. E. Novey, the president of the company, speaking to a representative of the *Electrical World*, stated that he had started business on March 1 with a capitalization of $40,000 and a floor space of 5,000 sq.ft. Mr. Novey had been the president of the Co-operative Electrical Supply Company of Chicago. The new company is carrying standard lines of fixtures and wiring materials. Alfred Bernstein is vice-president and I. Becker secretary.

The Board of Selectmen of Thompsonville (Conn.) plans to install a "white way" system of lighting on Main Street in the near future. The cost of installation is not to exceed $15,000.

The Milford (Conn.) Electrolytic Iron Company, recently incorporated, has leased the factory of Page & Nettleton and expects to start production in about two months.

The Coppus Engineering Corporation, of Worcester, Mass., manufacturer of steam turbines, turbine blowers, pumps, etc., has recently incorporated under the laws of Massachusetts with a capital stock of $500,000. The concern will operate the plant of the Coppus Engineering and Equipment Company, on Park Avenue, Worcester. The incorporators include Frans H. C. Coppus, Linwood M. Erskine, and Otto Wachsberg, all of Worcester.

The F. W. Wakefield Brass Company, Vermilion, Ohio, manufacturers of "Red Spot" lighting specialties, has recently received notification to the effect that Holophane Glass Company of New York has standardized on "Red Spot" hangers for both ceiling and suspension units.

The American Wireless Company of Hartford, Conn., has been incorporated under the laws of Connecticut to buy, sell, maintain and operate instruments, apparatus and all appurtenances to aerial communication. The capital stock is $30,000, and the incorporators are Jonathan Starr, Groton, Conn., Frank H. Foss and M. H. Foss, both of Windham, Conn.

The Johns-Pratt Company of Hartford, Conn., whose selling arrangements through the Johns-Manville Company were recently dissolved by mutual consent, has established a New York office in the Liggett Building. It is intended to have a complete representation at this office for the three departments of the company—"Noark" fuses and protective devices, "Vulcabeston" packing and Johns-Pratt molded products.

The Electric Specialty Company of Port Arthur, Texas, has just been organized to conduct an electrical goods retail business. The company is capitalized at $6,000, and the incorporators are J. M. Axwell, G. A. Jernigan and C. S. Powell.

The Canadian General Electric Company will absorb the Canadian Electric Appliance Company, Ltd., on Aug. 1, an announcement from Montreal states.

The Westinghouse Electric & Manufacturing Company recently shipped another trainload of electric railway apparatus from its East Pittsburgh plant. This shipment consisted of equipment for the French Midi Railways as part of an order which totaled over $1,000,000. The apparatus shipped weighed approximately 800 tons.

The Johns-Manville Company, operating plants at Wankegan, Ill., and Manville, N. J., will soon erect a plant at Asbestos, Quebec, for the manufacture of asbestos. This new plant will cost more than $1,000,000, employ upward of 300 people, and will take care of all Canadian manufactured asbestos requirements. The company announces that it has taken over the Bennett Martin Mine at Thetford Mines, Quebec. Heretofore 80 per cent of the world's asbestos output has been mined in Canada but manufactured elsewhere and much of it reimported into the Dominion. The new plant will be completed in six months, work beginning immediately. T. F. Manville, president of the company, and a large party of executives have just completed an inspection of the site and the mine. American capital is responsible for the development, although a large Canadian interest in the scheme also exists.

Foreign Trade Notes

GREAT INCREASE IN THE USE OF ELECTRICITY IN SHANGHAI, CHINA.—Unprecedented sales and profits during the past year, *Commerce Reports* states, are reported by the electrical department of the Shanghai Municipal Administration. The capital outlay for the year amounted to 20,771,489 taels ($15,786,332 at the 1921 average of 76 cents for the tael), with gross profits of 1,863,610 taels ($1,416,343). The net return for 1921 was 1,048,525 taels ($796,879), and the estimated profit for the current year was 1,152,000 taels ($875,520), both setting new high marks. In its output the Shanghai municipal electric plant almost equaled that of Manchester, England, which has the largest municipally owned station in Great Britain. The Shanghai plant now supplies 33,334 premises. Of the 185,364,746 units of electricity sold, 10 per cent was for private and 17 per cent for public lighting; heating and cooking took 5 per cent, power 32 per cent, and traction 6 per cent. At the end of 1921 its foreign staff numbered 135 and Chinese employees 2,797, increases over the previous year of 30 and 590 respectively.

THE LATVIA GOVERNMENT CONSIDERING HYDRO-ELECTRIC DEVELOPMENTS.—The construction of five hydro-electric plants on the Dvina, at a total cost of 53,600,000 Russian rubles, according to the *Electrical Review*, is under consideration by the government of Latvia. The two proposed for early erection are those at Kokenhusen (80,000 kw.), for railway electrification purposes, and at Dahlen (24,000 kw.), which will supply the Riga district. The other three will be at Stockmannshof (36,000 kw.), Keggum (36,000 kw.) and Ascheraden (16,000 kw.).

ELECTRIFICATION WORK AT BOMBAY.—Surveys, *Commerce Reports* states, are being made for the purpose of making accurate maps in connection with the proposed electrification work at the city of Bombay, India. An unofficial map has been received from the vice-consul at Bombay on which the lines proposed for electrification are indicated. This map is available from the electrical equipment division or the district and co-operative offices of the Bureau of Foreign and Domestic Commerce by requesting exhibit No. 60,695.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

A commercial agent in Australia (No. 2,954) desires to secure the representation of firms for the sale of electrical fittings, galvanized wire, etc.

Electrical goods dealers in Italy (No. 2,966) desire to purchase and secure an agency for electric cooking and heating apparatus, lamps and machines for electric installations, and electrical appliances and supplies in general.

A mercantile firm in Spain (No. 2,974) desires to purchase electrical supplies, etc.

New Apparatus and Publications

ELECTRIC CLEANER.—The Apex Electrical Distributing Company, Cleveland, has issued "The Apex Salesman's Manual," which is a treatise on house to house selling methods as applied to the "Apex" electric suction cleaner.

ELECTRIC HEATING DATA. — The Electrical Alloy Company, Morristown, N. J., has issued a bulletin entitled "Electrical Heating Reference Data," which gives instructions and suggestions on electrical heating. It also contains charts showing the current-carrying capacity of resistance ribbon and strip.

WIRELESS EQUIPMENT.—"Radio Enters the Home" is the title of a 128-page booklet published by the Radio Corporation of America, Woolworth Building, New York. It gives complete instructions for radio broadcasting and description of apparatus.

SYNCHRONOUS MOTORS.—Bulletin No. 1124, distributed by the Allis-Chalmers Manufacturing Company, Milwaukee, describes and illustrates its various types of synchronous motors.

ELECTRIC FIXTURES. — The O. C. White Company, 15 Hermon Street, Worcester, Mass., is distributing a folder covering its new line of "White" adjustable portable electric fixtures for plant and shop use.

SUCTION SWEEPER. — The Hoover Suction Sweeper Company, North Canton, Ohio, announces the development of a new heavy-duty "Hoover" suction sweeper, model 961, designed for clubs, hotels, offices.

RADIO RECEIVING SET.—The Main Radio Company, Marion Building, Cleveland, is distributing a leaflet describing the "Main" radiophone receiving set.

PANELBOARDS AND SWITCHBOARDS.—The Electric Motor & Engineering Company, Canton, Ohio, has issued catalog No. 3 (sections 2 and 3) covering its panelboards, switchboards, steel cabinets and power equipment specialties.

RECORDING INSTRUMENTS. — The Thwing Instrument Company, 3339 Lancaster Avenue, Philadelphia, is distributing bulletin No. 11, describing the "Thwing" radiation pyrometers, indicating and multiple-recording types.

ELECTROLYSIS. — The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued a pamphlet (Reprint 118) embracing an article by Prof. Charles F. Scott on the subject of "The Question of Inductive Interference and Electrolysis as Related to Railroad Electrification," which gives the causes and the remedial measures that have been applied.

VENTILATING SYSTEM.—The Spray Engineering Company, 60 High Street, Boston, Mass., is distributing a folder containing a recent reprint of an article entitled "Closed-Circuit Ventilating System for Cooling Turbo-Generator," which describes an installation of an air-cooling apparatus built by the Spray company.

COPPER CABLE.—The June 15, 1922, issue of the *Bulletin* of the Copper and Brass Research Association contains an article entitled "Ten Million Pounds of Copper Cable for Highest Voltage Transmission Line," which gives details of the order for the copper cable for the 220,000-volt transmission line of the Pacific Gas & Electric Company, San Francisco.

RESISTANCE THERMOMETER. — The Brown Instrument Company, Philadelphia, announces the publication of a new resistance thermometer catalog, covering various types of instruments made, etc.

FARM LIGHTING PLANT.—The Stearns Motor Manufacturing Company, Ludington, Mich., has recently developed a new "Stearns" farm lighting plant of 1,500 watts capacity.

DRIVE SCREWS.—The Parker Supply Company, 785 East 135th Street, New York City, is manufacturing the "Parker" hardened drive screws in sizes corresponding with machine screw diameters up to No. 14. A bulletin is available.

SMALL MOTORS.—The H. B. Sherman Manufacturing Company, Battle Creek, Mich., is distributing a small booklet describing the "Sherman" small motors recently placed on the market by the company. At present the motors are made in ¼, ⅓ and ½ horsepower, for both alternating and direct current.

AMMETERS AND VOLTMETERS. — Ammeters and voltmeters for use with radio transmitting and receiving sets are being made by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

ELECTRIC FURNACE.—"Hawley Electric Oscillating Brass Melting Furnaces" is the title of a small pamphlet issued by F. H. Niles & Company, Inc., 421 Claremont, Jersey City, N. J., describing the "Hawley" electric furnace manufactured by the Hawley Down Draft Furnace Company and sold by the Niles company.

New Incorporations

THE CHAMBLEE-CAMP GORDON WATER, LIGHT & POWER COMPANY, Atlanta, Ga., has been incorporated with a capital stock of $17,500 by Ammen M. Pierce, Fred A. Gates and R. E. Deans.

THE WOOD-REINECKE ELECTRIC COMPANY, Louisville, Ky., has been chartered with a capital stock of $30,000 by Biscoe Hindman, Chicago; Harry I. Wood and William Reinecke, both of Louisville.

THE MONTVALE-THAXTON TRANSMISSION COMPANY, Montvale, Va., has been incorporated with a capital stock of $25,000. The officers are: W. O. McCabe, Thaxton, president, and S. H. Price, secretary.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

BURLINGTON, VT. — The Burlington Light & Power Company has submitted a proposal to the Board of Aldermen offering to lease the municipal electric light plant and distribution system for a period of twenty years.

WORCESTER, VT.—The Selectmen have been authorized to enter into a contract with the Montpelier & Barre Light & Power Company to install an electric lighting system in the village.

CHELSEA, MASS.—The installation of an ornamental lighting system on Broadway, Washington and Everett Avenues is under consideration by the Board of Aldermen.

FRAMINGHAM, MASS.—Plans have been submitted to the Selectmen by the Edison Electric Illuminating Company for the installation of a new ornamental lighting system in the business district to be maintained by underground wires.

NORTH ATTLEBORO, MASS.—The New England Power Company, Worcester, has petitioned the Commission of Public Utilities for permission to extend its Milbury-Pawtucket transmission line through North Attleboro, Attleboro and Seekonk.

SOMERVILLE, MASS. — Plans for the proposed new junior high school, to cost about $800,000, provide for a vocational department.

North Atlantic States

HILTON, N. Y.—Application has been made to the Public Service Commission by the Cooper Electric Corporation and the Hilton Electric Light, Power & Heat Corporation, both of Hilton, asking authority for the transfer of the property and franchise of the Hilton company to the Cooper company, and for authority for the latter company to operate an electric lighting system in Parma, Monroe County. The Cooper company also asks for permission to issue $50,000 in capital stock, the proceeds to be used for the installation of an electric system to furnish service in Parma.

MARCY, N. Y.—Bids will be received by the State Hospital Commission, Capitol, Albany, until August 2 for furnishing three electric elevators as follows: Buildings for chronic patients, storehouse and cold-storage building at the Utica State Hospital, Marcy Division, Marcy.

NEW ROCHELLE, N. Y. — Work has begun on the foundation of the proposed new high-tension distribution substation of the Westchester Lighting Company to be erected at its plant on Echo Avenue, to cost about $75,000.

ROCHESTER, N. Y.—The Rochester Gas & Electric Company contemplates installing new electrical and steam equipment in its power plant. The construction of a new substation in the Twelfth Ward is under consideration by the company. This will involve the installation of an underground conduit to carry the transmission cables from Kodak Park to the lake.

SYRACUSE, N. Y.—Under the terms of the new contract with the Syracuse Lighting Company for street lighting, all arc lamps in the center of the city will be replaced with modern lamps.

TROY, N. Y.—Steps have been taken by the Kiwanis Club for the installation of an improved lighting system on the highway between Watervliet and Albany.

LAKEHURST, N. J. — Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Aug. 1 for two electric furnaces, for use at the local aircraft plant.

LAKEWOOD, N. J.—The Lakewood & Coast Electric Company has been granted permission to issue $83,000 in bonds and $21,000 in capital stock, part of the proceeds to be used for extensions and improvements.

SUMMIT, N. J. — The Commonwealth Electric Company has secured permission to issue $73,000 in bonds and $19,000 in capital stock, part of the proceeds to be used for extensions and improvements.

BERWYN, PA.—The Hester Price Canning Company contemplates rebuilding its factory and power plant, to cost about $40,000.

BETHLEHEM, PA.—Plans for the proposed local meat-packing plant to be erected by the Confederated Home Abattoirs Company, Portland, Me., include a power plant. The total cost is estimated at $1,000,000. Local offices have been established in the Odd Fellows' Building.

CORRY, PA.—The City Commission has authorized the installation of an ornamental lighting system in the business section. The plans call for forty-six lamps of 250 cp.

EAST PROSPECT, PA.—The East Prospect Borough Light, Heat & Power Company has petitioned the Public Service Commission for permission to distribute electricity in the borough of East Prospect. Hause, Evans & Baker, Harrisburg, are attorneys for the company.

GREENSBURG, PA.—Work will begin at once on the construction of a power house at the Westmoreland Hospital, to cost about $40,000.

GREENVILLE, PA.—The Public Service Commission has granted the Mercer County Light, Heat & Power Company permission to acquire the franchises and property of the following companies: Findley, Sugar Grove, Springfield, Pine, Liberty, Wold Creek, East Lackawanna, Worth, Jackson and Jackson Center Electric Companies.

PHILADELPHIA, PA.—The Philadelphia Rapid Transit Company has filed plans for a one-story addition to its substation at Frankford Avenue and Arrott Street.

PITTSBURGH, PA.—The Public Service Commission has given its approval for the erection of an electric transmission line by the West Penn Power Company to furnish electricity for lighting and power purposes in Greensburg and Unity Township, South Strabane Township and Redstone Township.

SCRANTON, PA.—Work will soon begin on the installation of new equipment at the power house at Adams Avenue and Gibson Street, to cost about $60,000. J. H. Williams, 425 Washington Avenue, is president of State Board of Control.

WINDSOR, PA. — Application has been made to the Public Service Commission by the Lower Windsor Township Public Service Company for permission to supply electricity in the township of Lower Windsor. Hause, Evans & Baker, Harrisburg, are attorneys for the company.

WOMELSDORF, PA. — Application has been filed with the Commission for Incorporation by the Womelsdorf Electric Company for a charter and also for permission to acquire the borough lighting plant in Womelsdorf.

WYOMISSING, PA.—Plans for the proposed group of buildings to be erected in Wyomissing for the Reading (Pa.) Hospital include a power house. The total cost is estimated at about $1,500,000. Richer & Eller, 147 North Fifth Street, Reading, are architects.

BALTIMORE, MD. — The United Railways & Electric Company has issued $2,500,000 in notes, part of the proceeds to be used for extensions and improvements.

CUMBERLAND, MD.—Plans are being prepared by the N. & G. Taylor Company, 300 Chestnut Street, Philadelphia, for a power plant at its local tin mills.

EASTON, MD.—The Public Service Commission has granted permission for extensions to the municipal power plant, including the installation of turbo-generators, etc.

PORT DEPOSIT, MD. — The Northern Maryland Electric Company has applied to the Public Service Commission for permission to purchase the property of the Port Deposit Electric Company and to issue $85,000 in bonds and $5,000 in capital stock, the proceeds to be used to finance the deal.

ALEXANDRIA, VA. — The Alexandria Light & Power Company has been incorporated with a capital stock of $650,000 to take over the properties of the Alexander County Lighting Company and the Arlington Electric Company.

RICHMOND, VA.—The new printing plant to be erected by the News-Leader Publishing Company, to cost about $300,000, will be equipped with electrically driven machinery, conveying machinery, etc. Baskerville & Lambert, Travelers' Building, are architects.

North Central States

DETROIT, MICH.—Plans have been prepared by the Ford Motor Company, Highland Park, for the construction of a new laboratory and mechanical research building, to cost, including equipment, about $500,000.

MICHIGAMME, MICH. — Preliminary surveys are being made by the Michigan, Iron, Land & Lumber Company for the construction of an electric power plant on Lake Michigamme. The proposed plant will supply electricity to the Imperial mine and to the village of Michigamme.

SAGINAW, MICH.—Plans for the proposed high school to be erected on the East Side, at a cost of about $250,000, call for a detached power house.

BELLEFONTAINE, OHIO.—Bids will be received by the Director of Public Service, Bellefontaine, until Aug. 3 for constructing an addition to the municipal water and electric plant.

CUYAHOGA FALLS, OHIO.—The installation of street lamps on Center Street has been authorized by Edward H. Hoppenstedt, service director.

LANCASTER, OHIO.—The Ohio Power Company will build a transmission line from Logan to Lancaster. The construction of a line from Logan to Nelsonville is also under consideration.

LORAIN, OHIO.—The Ohio Public Service Company contemplates an addition to its local power plant, including the installation of a 35,000-hp. turbo-generator, etc. A transmission line will be erected from Lorain to Mansfield. The cost of the entire project is estimated at $1,500,000.

NEVADA, OHIO.—The Village Council has granted the Ohio Power Company, Newark, a franchise to install an electric system here. The company will extend its transmission line from Bucyrus to Nevada to furnish the service.

TOLEDO, OHIO.—Work will begin at once on the construction of an addition to the Detroit Avenue substation of the Toledo Edison Company. This station will be the connecting link between the Acme power house, through the present underground transmission system or the new aërial high-tension belt line, and West End manufacturing district. The cost is estimated at about $200,000.

GEORGETOWN, KY.—Steps have been taken by the Chamber of Commerce for the installation of an ornamental lighting system on Main Street and Broadway.

CAMPBELLSBURG, IND. — The Interstate Public Service Company will erect a transmission line from Salem to Campbellsburg. When completed, the municipal power plant will be discontinued.

CONNERSVILLE, IND.—Work will soon be started by the Hydro-Electric Light & Power Company on extensive additions to its system, to cost between $150,000 and $200,000. The plans call for the dredging of the hydraulic canal, extending from the feeder dam 7 miles from Connersville, and the erection of five new power plants. The five stations will have a total output of 1,380 kw. Contract for construction work has been awarded to the Boyer Construction Company, Newcastle.

FORT WAYNE, IND.—Extensions and improvements are to be made to the system of the Indiana Service Corporation, to cost about $250,000, during the summer. The work will include the construction of a new switchhouse and the installation of a second generating unit. The company is now changing the power supply of all its lines, including interurban.

INDIANAPOLIS, IND.—The Indianapolis Light & Heat Company will build a substation of about 5,000 kw. capacity, to cost about $100,000.

CHICAGO, ILL. — The Commonwealth Edison Company will soon call for bids for an addition to its substation, 35 x ft. 75 ft., at 19 East Twenty-first Street, and also an extension to substation at 305 West Ohio Street.

CHICAGO, ILL.—The Star & Crescent Milling Company, 108 South La Salle Street, will build a one-story power plant at its factory in South Chicago.

CHICAGO, ILL. — The Commonwealth Edison Company has awarded a general contract to Thomas G. Gage, 64 West Randolph Street, for the construction of a one-story substation, 50 ft. x 190 ft., at 750-752 West Adams Street.

DAYTON, ILL.—The State Engineering Department has received permission from the Federal Power Commission to construct a hydro-electric power plant on the Fox River, near Dayton, with initial capacity of 1,500 hp.

MARINETTE, WIS.—The Republic Box Company, Chicago, contemplates building a new box and crating factory in Marinette to replace the plant damaged by fire last fall. The plans call for a one-story building, 100 ft. by 250 ft., with several wings and a separate power plant and boiler house.

MENOMINIE, WIS. — Plans are being prepared by the Wisconsin Public Service Corporation, 559 Marshall Street, Milwaukee, for the installation of an electric generating unit in Menominie and the erection of a transmission line, here. Mead & Seastone, Madison, are engineers.

PORT WING, WIS.—Arrangements have been made by the North Wisconsin Hydro-Electric Power Company for an issue of $125,000 in bonds for the completion of its power plant at Orienta Falls on Iron River, east of Port Wing. The plans provide for the construction of a dam 125 ft. long with a head of 80 ft., capable of developing 2,500 hp. The cost of the entire project is estimated at about $200,000. T. N. Okerstrom is president.

MAQUOKETA, IA.—A power house will be erected at the proposed high school, to cost about $150,000. Arthur Ebeling, Kahl Building, Davenport, is architect.

PLEASANT HILL, MO. — The Public Service Commission has granted the Green Hill Light & Power Company, Pleasant Hill, permission to purchase and operate the following properties: The electric power plant and distribution systems at Warrensburg and vicinity; distribution systems at Knobnoster, Montserrat, Lamonte, Concordia and surrounding territory; electric power plant and distribution system in Brookfield and vicinity; transmission line from Laclede to Linneus, and the portion of the transmission lines from Laclede to Sumner now owned by the Brookfield Electric Light Company and the North Missouri Power Company.

ST. JOSEPH, MO.—Extension and improvements to the municipal electric light and power plant, to cost about $300,000, are under consideration.

ST. LOUIS, MO. — The Department of Public Utilities has approved the resolution providing for the installation of 285 street lamps, to cost $53,000, on Kingshighway.

SIKESTON, MO.—Plans are being prepared for a municipal electric light and power plant. Fuller & Beard, Chemical Building, St. Louis, are engineers.

SPENCER, S. D.—The property of the Spencer Light & Power Company has been purchased by the Minnesota Electric Distributing Company, Minn. Electricity will be supplied from the Sioux Falls plant. The Minnesota company plans to extend the main transmission line from Salem to Spencer and eventually north to Canova.

PLATTSMOUTH, NEB.—The installation of an ornamental lighting system in the business district is under consideration.

WICHITA, KAN.—The Kansas Gas & Electric Company contemplates the construction of a new transmission system, from Eldorado to southeastern Kansas, to furnish service in that section.

Southern States

DURHAM, N. C.—The Durham Public Service Company is planning to install an ornamental lighting system on East Chapel Street.

LAKELAND, FLA.—The City Commission is considering the installation of additional equipment in the municipal electric plant.

VERO, FLA.—Extensions to the municipal electric light plant, to cost about $40,000, are under consideration.

JACKSON, ALA.—At an election to be held Aug. 8 the proposal to issue $36,000 in bonds for the installation of an electric light plant and waterworks system will be submitted to the voters.

MONTGOMERY, ALA. — The Atlantic Coast Line Railway Company, Wilmington, N. C., is planning to rebuild the portion of its car and locomotive shops recently destroyed by fire, at a loss of about $200,000.

OSYKA, MISS. — The Central Light & Power Company, Amite, La., contemplates erecting a transmission line from Ponchatoula to Osyka to furnish electricity here.

ASHDOWN, ARK.—The installation of a municipal lighting plant is under consideration by the Council.

BLYTHEVILLE, ARK.—The Arkansas-Missouri Power Company has been granted permission by the Arkansas Railroad Commission to issue $625,000 in bonds for extensions and developments. The company will acquire the properties of the Missouri-Southeastern Utilities Company and the Caruthersville-Kennet Light & Power Company, Caruthersville.

STAMPS, ARK.—Bids will be received by C. G. Lunday, vice-president of the Louisiana & Arkansas Railway Company, Stamps, until July 31 for construction of locomotive repair shops at Stamps, includ-

ing power house and equipment. Harrington, Howard & Ash, Kansas City, Mo., are consulting engineers.

MELVILLE, LA.—Extensions and improvements will be made in the municipal electric plant and water works system, to cost about $40,000. Swanson & McGraw, Inc., United Fruit Building, New Orleans, are engineers.

ARDMORE, OKLA.—The City Commission has contracted with the Ardmore Power Company for the construction of a transmission line to the municipal pumping plant at City Lake.

VINITA, OKLA.—Steps have been taken by the Chamber of Commerce to secure the installation of an ornamental lighting system.

CORSICANA, TEX.—Steps have been taken by the Chamber of Commerce for the installation of an ornamental lighting system on Beaton Street. It is proposed to use ornamental standards mounted with cluster of lamps. George F. Baum is chairman of committee.

LUBBOCK, TEX.—The Texas Utility Company is preparing plans for the installation of additional units at its local power plant. A transmission line will be erected to Idalou, Lorenzo, Ralls and Crosbyton. The cost is estimated at $250,000.

LUFKIN, TEX.—The city officials have been authorized to enter into a contract with the Lufkin Light & Power Company for the installation of a new street-lighting system. Ornamental lamps are to be used in the business district and 100-cp. lamps in the residential section.

ROBSTOWN, TEX.—The Robstown Gin & Ice Company will make extensions in its power plant, including the installation of new equipment.

SEQUIN, TEX.—Plans have been completed for the installation of an ornamental lighting system from the Southern Pacific depot to the court house, covering a distance of 1 mile.

Pacific and Mountain States

CLE ELUM, WASH.—The Chicago, Milwaukee & St. Paul Railroad Company is planning to rebuild the portion of its local substation recently destroyed by fire. The loss is estimated at about $20,000.

BANKS, ORE.—The Murphy Timber Company, Portland, is planning to rebuild its lumber mill, recently destroyed by fire, causing a loss of about $200,000. All machinery will be electrically driven.

BAGBY, CAL.—The Mariposa Mining Company plans to rebuild its power house at its properties near here, recently destroyed by fire.

BANNING, CAL.—The City Trustees are negotiating for the purchase of the local electric plant to be owned and operated by the municipality. If taken over by the city, extensions and improvements will be made. If not purchased, a new plant and system will be built.

CHICO, CAL.—The Butte Meadows Company has been granted permission by the State Water Commission to construct a hydro-electric plant on Butte Creek.

LONG BEACH, CAL.—The Southern California Edison Company has applied for permission to construct a substation on West Third Street.

LOS ANGELES, CAL.—Bids will be received by Thomas Oughton, city purchasing agent, City Hall Annex, until Aug. 2 for 61,000 ft. of fire-alarm cable, as per Specification 498.

MONTEREY, CAL.—The Del Monte Light & Power Company is reported to be contemplating the erection of a transmission line from Monterey to Gastroville, via Del Monte, Seaside and Marina.

TURLOCK, CAL.—Bids will be received by the Turlock Irrigation District until Aug. 3 for the erection of 28 miles of 66,000-volt transmission line as follows: (1) For line complete (contractor to furnish all material); (2) for labor only, the district to furnish materials; (3) for material, including about 200 steel towers, 170 miles of copper or steel reinforced aluminum wire, about 6,000 suspension-type insulators with fittings, switchboard panel, lightning arresters and oil circuit breakers. R. V. Meikle is chief engineer.

UKIAH, CAL.—The Snow Mountain Water & Power Company, 216 Pine Street, has applied to the State Water Commission for permission to construct hydro-electric plants on the Middle Eel River, Thatcher and Elk Creeks. It is estimated that 12,000 hp. can be developed at a cost of about $10,000,000.

MURTAUGH, IDAHO.—The Public Utilities Commission has granted the Murtaugh Light & Power Company, recently incorporated, permission to erect transmission lines and distribute electricity in certain territory ir Twin Falls and Cassia Counties. Electricity will be purchased from the Idaho Power Company.

DENVER, COL.—The Denver & Salt Lake Railroad Company is planning to rebuild its shops at Utah Junction, recently destroyed by fire, causing a loss of about $700,000.

Canada

ENDERBY, B. C.—The installation of a municipal electric light plant, to cost about $23,000, is under consideration.

BELLE RIVER, ONT.—A bylaw providing for obtaining electricity from the system of the Hydro-Electric Power Commission of Ontario has been approved by the ratepayers.

LONDON, ONT.—Work will soon begin on the erection of a transmission line to serve London Township. In connection with this it is proposed to extend the service in both Broughdale and Oxford Park. Work also will soon be started on the erection of a new transmission line from Delaware to Melbourne, a distance of 10 miles. J. M. Wilson, engineer, of the Hydro-Electric Power Commission of Ontario, is in charge of the work.

QUEBEC, QUE.—Notice has been served on the Quebec Railway, Light, Heat & Power Company by the city of Quebec that if work is not started on the proposed extensions on Dorchester Street and on the Charlesbourg Road before Aug. 1 steps will be taken by the city to nullify the contract.

Electrical Patents

Announced by U. S. Patent Office

(Issued July 11, 1922)

1,422,110. INTERLOCK CIRCUIT PROTECTOR; J. Lebovici, Oakley, Ohio. App. filed April 26, 1919. Trouble in one phase opens all phases.

1,422,120. REGULATING AND CONTROL APPARATUS AND SYSTEM; F. W. Meyer, Milwaukee, Wis. App. filed March 24, 1920. Electroionic rectifier for charging storage batteries.

1,422,130. ELECTRICAL HEATER RESISTANCE ELEMENT; R. W. Reynolds, Darlinghurst, New South Wales, Australia. App. filed Feb. 18, 1921. Film composed powdered graphite and aluminum silicate.

1,422,134. MOTOR CONTROLLER; T. H. Rodman, New York, N. Y. App. filed Aug. 27, 1920. Controller for printing-press motors.

1,422,135. METHOD OF MANUFACTURING CALCIUM CARBIDE; W. B. Rogatz, Plattsburg, N. Y. App. filed May 5, 1921. By electric arc.

1,422,170. ELECTRICAL CONNECTOR DEVICE; R. B. Benjamin, Chicago, Ill. App. filed Dec. 19, 1917. Pull-switch lamp receptacle.

1,422,188. BRUSH HOLDER FOR ELECTRIC MACHINES; E. Dorffel, Bernburg, Germany. App. filed March 10, 1921. Holder pivoted and held against commutator by spring.

1,422,207. INDICATING AND RECORDING APPARATUS; A. C. Johnson, Chicago, Ill. App. filed Dec. 6, 1918. Records actual operating period of a machine.

1,422,224. SPEED INDICATOR FOR AËROPLANES; A. F. Poole, Kenilworth, Ill. App. filed May 31, 1918. Operated by earth's magnetic field.

1,422,239. FLASHLIGHT; C. W. Swingle, Chicago, Ill. App. filed May 7, 1920. Hand-operated, self-contained generator.

1,422,241. ELECTRIC MULTIPLE CONNECTION PLUG; C. H. Tomlinson, Mansfield, Ohio. App. filed April 17, 1912. For multiple-control system for electric cars.

1,422,243. ELECTROMAGNETIC POWER TRANSMISSION APPARATUS; R. W. Van Norden, San Francisco, Cal. App. filed Oct. 30, 1918. Electromagnetic speed-reduction gear.

1,422,257. CIRCUIT CONNECTOR; Harry A. Douglas, Bronson, Mich. App. filed Aug. 15, 1918. Plug and socket.

1,422,312. ELECTRIC CONDENSER; Franklin S. Smith, Philadelphia, Pa. App. filed Feb. 12, 1919. Gas used as dielectric.

1,422,317. ELECTROMAGNETIC MEASURING APPARATUS; J. C. Stangier, Chicago, Ill. App. filed March 16, 1918. Indicates momentary flow of current.

1,422,331. ADAPTER; F. T. Baird, Blue Island, Ill. App. filed Jan. 13, 1921. Portable electric lantern.

1,422,348. ELECTRIC STEAM-PRESSURE COOKER; W. A. Duncan, Chicago, Ill. App. filed March 14, 1922. Heating element placed in receptacle similar to fireless cooker.

1,422,374. CONDUIT COUPLING; J. F. Rambo, Pomona, Cal. App. filed April 29, 1920. For supporting conduit from other pipes.

1,422,395. MULTI-DISK ELECTRIC MACHINE; R. H. Wappler, Yonkers, N. Y. App. filed Dec. 12, 1919. Supplies current to X-ray machine.

1,422,396. CLAMP MOUNTING FOR ELECTRODES; R. H. Wappler, Yonkers, N. Y. App. filed Feb. 14, 1921. Body contacts for medical apparatus.

1,422,414. ROTOR SPIDER; James Burke, Erie, Pa. App. filed Nov. 6, 1919. Wheel with welded spokes holds field coils.

1,422,415. AUTOMATIC ELECTRICAL CONTROLLING DEVICE; C. F. P. Carrier, Philadelphia, Pa. App. filed Oct. 9, 1919. For cutting machines in and out of operation.

1,422,427. ELECTRIC APPARATUS FOR PROPELLING PROJECTILES; A. L. O. Fauchon-Villeplee, Paris, France. App. filed April 1, 1919. Electric gun with energizing bars the length of gun.

1,422,429. CONNECTION FOR ELECTRICAL APPARATUS; C. D. Filkins, Schenectady, N. Y. App. filed April 21, 1919. Connectors for radio variometers.

1,422,439. ANODE FOR LUMINOUS-ARC LAMPS; C. A. B. Halvorson, Jr., Lynn, Mass. App. filed Sept. 26, 1919. Made of iron shell with copper core.

1,422,443. LEADING-IN WIRES FOR INCANDESCENT ELECTRIC LAMPS; F. Hoge, Zoug, Switzerland. App. filed Feb. 26, 1919. Composed of tungsten and fused glass.

1,422,447. SWITCHING KEY; Le Roy W. Kelsay, New York, N. Y. App. filed Feb. 8, 1921. Used with oscillating connector blocks.

1,422,470. INDUCTIVE-INTERFERENCE-SUPPRESSION DEVICE; H. S. Osborne, New York, N. Y. App. filed Aug. 3, 1920. Auxiliary winding in transformers.

1,422,481. ELECTRIC VACUUM APPARATUS; M. Schenkel and J. Jüst, Charlottenburg, Germany. App. filed Aug. 12, 1916. Metallic vapor rectifiers.

1,422,484. MEANS FOR CONTROLLING AND MEASURING A CURRENT FLOWING IN AN ALTERNATING-CURRENT CIRCUIT; E. C. Schweitzer, Chicago, Ill. App. filed Feb. 13, 1919. By electrolytic means.

1,422,487. TELEPHONE ATTACHMENT; T. W. Small, Cleveland, Ohio. App. filed May 19, 1919. Attachment holds receiver to user's ear.

1,422,523. SIGNALING MECHANISM; C. E. Beach, Binghamton, N. Y. App. filed June 18, 1917. Municipal police signaling system.

1,422,553. INCLOSED ARC LAMP AND METHOD OF STARTING THE SAME; E. Friederich, Berlin, Germany. App. filed Jan. 28, 1916. Mercury-vapor lamp.

1,422,590. CLOCK; P. Mansel, Siemensstadt, Germany. App. filed Feb. 6, 1917. Striking mechanism actuated by electricity.

1,422,592. COMPENSATING STARTING SWITCH; Van N. Marker, Chicago, Ill. App. filed Oct. 23, 1919. Compensator completely cut out of circuit.

1,422,625. ELECTRICAL CONTROL APPARATUS; C. Schwartz, New Rochelle, N. Y. App. filed Feb. 27, 1918. Relay closing switch.

1,422,653. ELECTRICAL TRANSFORMER FOR REGULATING OR VARYING THE VOLTAGE OF THE CURRENT SUPPLIED THEREFROM; F. E. Berry, Hayes, England. App. filed Dec. 27, 1918.

1,422,672. THERMOCOUPLE; T. G. Coghlan, Wellsburg, W. Va. App. filed March 9, 1921. Indicates temperature in combustion-engine cylinders.

1,422,686. FARE-RECORDING APPARATUS; P. R. Forman, Rahway, N. J. App. filed July 22, 1919. Indicates number of fares collected but not the amount.

1,422,721. ELECTRICALLY HEATED UTENSIL; J. F. Lamb, New Britain, Conn. App. filed Aug. 18, 1919. Soldering iron.

1,422,733. METHOD OF PRODUCING IRON AND STEEL; W. E. F. Bradley, New York, N. Y. App. filed July 17, 1918. By passing a hydrocarbon gas through a molten mass of metal or ore in an electric furnace.

1,422,735. AUTOMATIC MEANS FOR CONTROLLING ELECTRICALLY HEATED DEVICES; A. F. Brown, Los Angeles, Cal. App. filed Jan. 16, 1918. Thermostatic cutout.

1,422,747. RENEWAL OF THE FILAMENTS IN METAL-FILAMENT ELECTRIC LAMPS; S. Coxon, Liverpool, England. App. filed Sept. 2, 1920. Apparatus for winding new filament on to supports.

1,422,765. BATTERY GRIP; C. E. Johnson, Chanute, Kan. App. filed June 1, 1921. For connecting lead wires to terminals.